Harvard School Of Public Health

OFFICIAL REGISTER OF HARVARD UNIVERSITY

1980/81

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Official Register of Harvard University

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Every effort is made to insure the information contained in this *Register* is accurate at the time of publication. However, the School of Public Health reserves the right to make changes without notice in tuition and fees, admission and degree requirements, courses of instruction, and any other information contained herein.

As a matter of policy, Harvard University does not discriminate among applicants and students in admissions, educational policies, scholarship and loan programs, and athletic and other programs on the basis of race, religion, sex, national origin, color, creed, handicap, age, sexual orientation, marital or parental status, or status as a Vietnam era or disabled veteran.

Academic Calendar, 1980-81

Fall Term

***September 8, Monday**
Orientation and registration for new international students: 10:30 A.M., Shattuck International House, 203 Park Drive.

***September 9, Tuesday**
Registration for new U.S. students: 12:00-2:00 P.M., G-Level, Kresge Building.
Opening Session for all new students: 2:00-4:00 P.M., G-1 auditorium, Kresge Building.

*All new students are required to attend the opening session and to be present for the registration period.

September 10, Wednesday
Registration for all returning students, 9:00-5:00 P.M., G-Level, Kresge Building. Students who fail to register on the appointed dates will have a $10 late fee assessed on their fall term bills.
The period between the opening sessions and September 15 will be devoted to orientation lectures, individual conferences with faculty members, and selection of courses of study.

September 15, Monday
First period "a" courses begin.

September 24, Wednesday
Study cards for *all returning students* due by 5:00 P.M. in Registrar's Office. Students who hand in late study cards will be charged a $10 fee. Once a study card is filed, all changes must be made on drop/add petitions. A $10 fee is charged for each petition submitted. Students are allowed one free petition during the "b" and "d" periods.

October 1, Wednesday
Study cards for *all new students* due in Registrar's Office by 5:00 P.M. Students who hand in late study cards will be charged a $10 fee. Once a study card is filed, all changes must be made on drop/add petitions. A $10 fee is charged for each petition submitted. Students are allowed one free petition during the "b" and "d" periods.
Last day to drop/add and change grading options for "a" and "ab" period courses.
Last day to cross-register at HSPH for "a" and "ab" courses.
Last day to register for the fall term at HSPH. Last day to cancel registration with refund of term bill payment.

October 13, Monday
Columbus Day, a holiday.

October 29, Wednesday
Bound, signed theses due by 5:00 P.M. in the Registrar's Office for doctoral students applying for November degrees.

November 7, Friday
First period ends.

November 10, Monday
Second period "b" courses begin.
Students are allowed one drop/add petition for "b" and "bc" courses without charge.

November 11, Tuesday
Veterans' Day, a holiday.

November 26, Wednesday
Last day to drop/add and change grading options for "b" and "bc" period courses.
Last day to cross-register for "b" and "bc" courses.

November 27 through November 30
Thursday through Sunday
Thanksgiving recess.

December 1, Monday
Deadline for filing degree applications for degree in March, 1980.
Deadline for applications for Non-Resident doctoral status for spring term.

December 21, 1980-January 4, 1981
Sunday through Sunday
Recess.

January 12, Monday
Spring study card materials available in Registrar's Office for continuing students.
Note: Students registered through the year will not be allowed to file study cards for the spring term until all fall tuition and at least one-quarter of the spring tuition has been paid.
Last day to add "e" period courses.

January 16, Friday
Second period courses end. Deadline for completing previous spring term courses given *Incomplete*.

January 19 through January 23
Monday through Friday
Supervised special studies or field observations: "e" period.

January 23, Friday
Registration for students not enrolled during the fall semester. Students should come in person to the Registrar's Office by 5:00 P.M.

Degree Calendar

For a diploma for a degree to be awarded in:	Degree applications are due in Registrar's Office on:	Bound theses are due in the Registrar's Office on:
November, 1980	**August 15, 1980**	**October 29, 1980**
March, 1981	**December 1, 1980**	**February 25, 1981**
June, 1981	**April 1, 1981**	**May 28, 1981**

Spring Term

January 26, Monday
Third period "c" courses begin.

February 4, Wednesday
All study cards due in Registrar's Office by 5:00 P.M. Students who hand in late study cards will be charged a $10 fee. After a study card is filed, all changes must be made on drop/add petitions. A $10 fee is charged for each petition processed. Students are allowed one free petition during the "d" period.

February 11, Wednesday
Last day to drop/add and change grading options for "c" and "cd" courses.
Last day to cross-register at HSPH for "c" and "cd" courses.
Last day to register for the spring term or to cancel registration with refund of spring term bill payment.

February 16, Monday
Washington's Birthday, a holiday.

February 25, Wednesday
Bound, signed theses due by 5:00 P.M. in the Registrar's Office for doctoral students applying for March degrees.

March 20, Friday
Third period ends.

March 22 through March 29
Sunday through Sunday
Spring recess.

March 30, Monday
Fourth period "d" courses begin.

April 1, Wednesday
Deadline for filing degree applications for degrees in June.

April 15, Wednesday
Last day to drop/add and change grading options for "d" period courses.
Last day to cross-register for "d" courses.

May 1, Friday
Last day to file petition for Non-Resident doctoral status for the academic year 1981-82.

May 22, Friday
Fourth period ends. Deadline for registration and tutorial forms for HSPH summer tutorials. Deadline for completing fall term courses given *Incomplete*.

May 25, Monday
Memorial Day, a holiday.

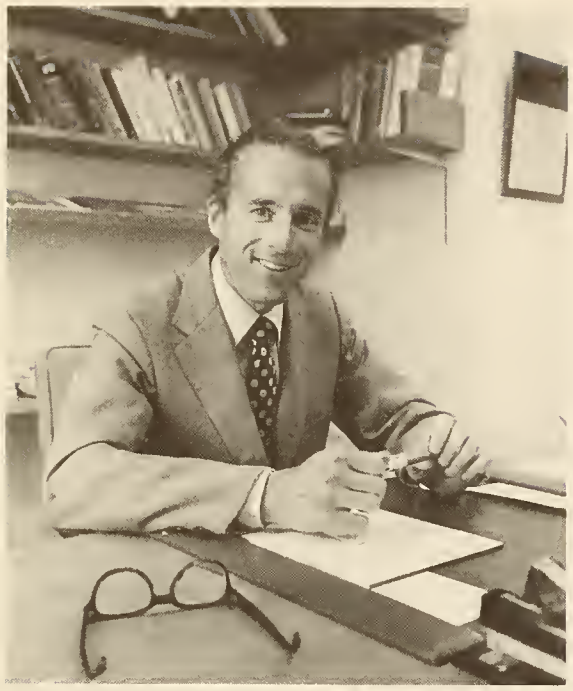
May 28, Thursday
Bound, signed theses due by 5:00 P.M. in Registrar's Office for doctoral students applying for June degrees.

May 26 through June 3
Post-class period.

June 4, Thursday
Commencement.

August 15, Friday
Deadline for filing degree applications for degree in November, 1981.

A Note from the Dean



The School's primary missions are the education of scholars who seek to understand and ameliorate the health problems of society, the execution of the research that addresses those problems, and the training of professionals who deal with them. The scope of its teaching and research programs extends all the way from the development of concepts and methods through studies of natural phenomena and of policy development, to the ultimate steps of implementation and evaluation. The School's programs concern two major areas. The first is disease prevention and involves the biological, chemical, physical and social factors that affect the health of society. The second is the organization and function of systems involved in the delivery of health services.

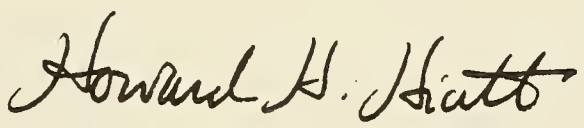
Public health is not itself a discipline, but its practitioners require expertise in one or more of a group of disciplines. The increasing complexity of public health questions requires the skills of quantitative analytic, natural, behavioral, social, and managerial scientists. The academic programs of the School must impart a sound background in a basic discipline as well as an active and credible experience in the application of the discipline to health problems. They must also demonstrate how people from different disciplines can cooperate in approaches to health problems.

We are a professional school. Strong training programs are required for new health professionals and for those in mid-career status. Health care systems in this country and abroad require professionals well-equipped to plan and manage the use of resources. With recent and prospective changes in health policy in the United States, our professional graduates must be equipped to anticipate, encourage and deal with change, and to be among its leaders. In our complicated society, critical problems in areas such as occupational health, nutrition, population, and pollution of the air, the soil and the water all share certain characteristics. A better data base of solid scientific information is essential, but inadequate by itself, to equip professionals to identify and implement socially appropriate and effective policy. Resources are scarce, and costs and benefits must be calculated. Large organizations must often be influenced to change their behavior and large groups of people mobilized to implement new policies. And this must be done in a context in which available data are incomplete, inference difficult, and the world not well understood.

The School's professional programs, therefore, must be based on both natural and social sciences and must depend heavily on quantitative analytic methods. The programs must emphasize a symbiotic relationship between our historically strong areas and a potentially unique set of analytic and managerial skills applied to health — all of which are needed to improve public health in the current context. This is true not only for degree programs designed to train new health professionals, but also for our efforts to rapidly assist today's public health professionals by making available strong mid-career educational opportunities.

The School has traditionally sponsored programs directed at the health problems of the developing world. Disease, malnutrition, population excess relative to resources, and the closely linked problems of inadequate educational opportunities and economic under-development are of great professional concern to much of our faculty and student body. That the School should be concerned with these critical problems is generally agreed. The question of appropriate roles for the School in this area is now receiving much faculty attention, and will surely be guided by the judgment and advice of colleagues from developing countries. As health programs in those countries evolve, continuing change in our programs can (and should) be anticipated.

The boundaries of public health are ever widening, and this School has assumed a leadership role in that process. It is continuing its commitment to traditional public health approaches and integrating them with approaches more recently identified as important. Our students must gain an appreciation of, and participate in, the major contributions to health made by a growing circle of disciplines.



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Joe David Wray, A.B., M.D., M.P.H., Director of the Office of International Health

Degree Requirements

The School of Public Health offers programs leading to the graduate degrees of *Master of Public Health* (M.P.H.), *Doctor of Public Health* (Dr.P.H.), *Master of Occupational Health* (M.O.H.), *Master of Science* in a specified field (S.M. in . . .), and *Doctor of Science* in a specified field (S.D. in . . .). The general degree requirements and the respective requirements for admission are discussed in the following sections.

Master of Public Health

The program leading to the Master of Public Health degree consists of one academic year of study designed to prepare professionals for careers in public health practice. Through the core curriculum, the program provides a broad background in various disciplines basic to public health. Through the choice of elective courses students may acquire more breadth of knowledge or may pursue in some depth one or more areas of particular relevance to their career goals. The M.P.H. degree program may serve as a required academic year for residency training in General Preventive Medicine (see p. 18).

Requirements for Admission

Applicants to the M.P.H. program must satisfy the Committee on Admissions and Degrees as to their academic ability, the relevance of their previous education and experience, and their overall qualifications for graduate professional education in public health. Ordinarily, an applicant should hold a doctoral degree in medicine, dentistry, or veterinary medicine. Consideration is also given to applicants who hold doctoral degrees in biology, behavioral sciences, other natural sciences and social sciences, or law, economics, engineering, and certain related fields regarded by the School as appropriate background for entrance into the public health profession. Applicants who hold an earned doctoral degree are urged to submit scores from the Aptitude Test of the Graduate Record Examination (GRE) or other aptitude tests such as the Law School Admission Test (LSAT), the Medical College Admission Test (MCAT), or the Dental Aptitude Test (DAT), if available.

Consideration for admission to the M.P.H. program is given also to an applicant who holds a master's degree in a field related to public health such as nursing or social work, with a highly distinguished academic record, and substantial professional experience. These applicants must be able to demonstrate sufficient knowledge and competence to satisfy the Committee on Admissions and Degrees as to their qualifications for professional public health education and must submit scores from the Aptitude Test of the Graduate Record Examination. Scores from the GRE Aptitude Test should be no more than five years old.

Requirements for the Degree

An M.P.H. degree candidate must spend one academic year in residence at the University and must successfully complete courses totaling a minimum

of 40 credit units. Students will be encouraged to take a total of 45 to 50 credit units.

Candidates for the M.P.H. degree are expected to complete the requirements in one academic year of full-time study. In rare instances, upon written request to the Committee on Admissions and Degrees, a student may be allowed to complete the program over a period of two academic years. The M.P.H. core courses must be completed in the first year.

Students who have taken courses at the School prior to entrance into this degree program may be able to use those courses to satisfy specific M.P.H. or departmental course requirements, but they must still complete a minimum of 40 credit units as degree candidates. In any event, students are required to pay one full year of tuition.

The Core Curriculum

The core curriculum, required of *all* M.P.H. degree candidates, is designed to provide a fundamental knowledge of the major areas of public health. Students must take the four core courses which cover the environment, quantitative methods, and health administration and management. In addition, students select one of three courses which use the case method to integrate the various disciplines of public health. The core courses are:

EHI 201a&b (or c&d) Principles of Environmental Health (5 credit units)
BIO 101a,b Principles of Biostatistics (5 credit units)
EPI 201a Introduction to Epidemiology (2.5 credit units)
HPM-HSA 221a,b Administration of Health Services (5 credit units)
AND, either
ID 221b Case Studies in Decision Making in the Control of Infectious Diseases of Public Health Importance (2.5 credit units)
or
ID 223c Integrated Case Studies in Public Health (2.5 credit units)
or
ID 225d A Case Study in Urban and Industrial Health Planning in a Developing Country (2.5 credit units)

Ordinarily, the core courses represent less than half of the total number of credit units recommended for the degree, thus allowing for flexibility in the program. Descriptions of each course appear in the section, *Courses of Instruction.*

Master of Public Health Program Office

Chief Coordinator: Dr. Drolette
Coordinators: Dr. Boyer, Dr. Nichols, and Dr. Yerby

The coordinators have day-to-day responsibility for the M.P.H. degree program, oversee the core curriculum, and serve as the M.P.H. Subcommittee of the Committee on Admissions and Degrees. They meet regularly with the Master of Public Health Program Committee, composed of a faculty representative of each department at the School, and representatives of students, alumni, and the School administration. The M.P.H. Program

Office, located in the Office of Student Affairs, serves as a departmental office for students in the General Program, and provides a central source of information about the M.P.H. degree program to all students and applicants.

Departmental Concentrations

The M.P.H. is an interdisciplinary degree and does not carry a departmental designation. Many students have specialized goals and they choose to take most of their elective courses in one department. They often prefer to concentrate in that department. Departments differ in their expectations of M.P.H. degree candidates. Some advise them to take a specific set of courses over and above the M.P.H. core curriculum, while others determine students' needs on an individual basis. For further information about a specific departmental concentration, please check with the department.

The General Program

The General Program, under the direction of the Coordinators of the M.P.H. Program, takes cognizance of the fact that many students seek a broader view of public health than that which a departmental affiliation permits. Students in the General Program may choose their elective courses from a variety of courses offered by the School of Public Health and other faculties at Harvard and M.I.T. Faculty advisors are assigned with each student's background and interests in mind. Members of the M.P.H. Committee serve as advisors to most of the students in the General Program. Even within the General Program it is possible for a student to concentrate to some extent in a particular discipline through the appropriate choice of electives.

The International Track

Students interested in careers in International Health are encouraged to supplement the core curriculum with courses which make up the International Health "track." These courses are:

ID 209a,b Health Services in Developing Countries (2.5 credit units)
Plus 2 of the following 3:
POP 200a,b Introduction to Population Sciences (2.5 credit units)
NUT 210a,b Nutrition Problems of Less Developed Countries (2.5 credit units)
TPH 201a Ecology, Epidemiology, and Control of Important Parasitic and Viral Diseases of Developing Countries (3 credit units)

The Office of International Health Programs serves as a source of information to students on other courses which are relevant to international health (see p. 60).

Combined Degree Programs

Students currently enrolled in an M.D., D.M.D., D.D.S., or D.V.M. program may apply for admission to the M.P.H. program, provided that a combined program can be arranged that meets the approval of both the Committee on Admissions and Degrees at the School of Public Health and the institution from which the doctoral degree is being earned. Students usually apply in their second or third year of medical, dental, or veterinary

school. Requirements for the M.P.H. degree (described on p. 9) are the same for students in the combined degree program as for all other M.P.H. degree candidates. Students enrolled in a combined degree program with the M.P.H. will receive the M.P.H. upon successful completion of both degree programs and conferral of the doctoral degree.

Doctor of Public Health

The Doctor of Public Health is an advanced professional degree for those who intend to pursue academic or research careers in public health, including administrative, planning, or evaluation roles in public health practice. The degree is granted on successful completion of an approved program of independent and original investigation in a special field of public health and the presentation of the results of this research in an acceptable thesis.

Requirements for Admission

An applicant for admission to candidacy for the Doctor of Public Health degree normally must be a graduate of an approved school of medicine, dental medicine, or veterinary medicine. Depending on the intended field of specialization, consideration may also be given to a candidate who holds an advanced degree in one of the disciplines basic to public health. In addition, the applicant must hold, or be in progress toward, the degree of Master of Public Health, or its equivalent, from an approved institution.

Applicants must be able to satisfy the Committee on Admissions and Degrees as to their overall qualifications for doctoral study at the School and must demonstrate potential ability to undertake original investigation in a special field. Scores for the Aptitude Test of the Graduate Record Examination must be submitted by all applicants who do not hold an earned doctoral degree, and should be no more than five years old.

Applicants who hold an earned doctoral degree are urged to submit aptitude scores from the GRE, or other tests such as LSAT, MCAT, or DAT, if available.

Requirements for the Degree

Formal requirements for the Doctor of Public Health degree are the same as those for the Doctor of Science degree. A brief summary of these requirements appears on pp. 16-17.

Master of Occupational Health

The program leading to the Master of Occupational Health degree is designed to provide physicians with postgraduate training in the public health disciplines that are relevant to the development of programs to prevent occupational disease and injury. This one-year degree program may be taken as part of a two-year approved residency in occupational medicine, or it may be taken as an independent one-year program.

Requirements for Admission

Candidates must be graduates of an approved school of medicine and must satisfy the Committee on Admissions and Degrees as to their scholastic ability to study at the graduate level. Students from the United States must have completed an internship or residency of at least twelve months in a hospital approved by the American Medical Association. Applicants are urged to submit scores from the Medical College Admissions Test (MCAT) or the scores of the Aptitude Test of the Graduate Record Examination (GRE), if the latter are available.

Requirements for the Degree

Candidates for the M.O.H. degree must spend one academic year in residence at the University and must successfully complete a program of at least 40 credit units, comprising both required and elective courses.

All candidates are expected to take the following courses unless they can demonstrate equivalent preparation:

1. Biostatistics 101a,b, *Principles of Biostatistics* (5 credits)
2. Epidemiology 201a, *Principles of Epidemiology* (2.5 credits)
3. Environmental Health Interdepartmental 201a,201b/201c,201d, *Principles of Environmental Health* (5 credits)
4. *Either* Environmental Health Sciences 271a,b, *Introduction to Radiation Protection* (5 credits) *or* Physiology 207c,d, *Radiation Biology* (5 credits)
5. Environmental Health Interdepartmental 207a,b, *Policy Issues in Occupational Health* (5 credits)
6. Environmental Health Interdepartmental 251c,d, *Basic Problems in Occupational Health and Industrial Environments* (5 credits)

The total number of credits in required courses is 27.5. Additional courses may be selected from the curriculum approved for residencies in occupational medicine.

Master and Doctor of Science in Specified Field

The School offers programs leading to the degrees of Master and (in most cases) Doctor of Science in designated fields of concentration. The prospective applicant should note that in some areas, the Master of Science program is intended primarily or wholly as preparation for doctoral study; applicants are screened for their interest in, and potential for, doctoral work, and the majority of students continue toward the Doctor of Science degree. In other areas, the Master of Science is viewed primarily or wholly as a terminal degree; while a small percentage of students may continue for the doctorate, the majority discontinue study upon receipt of the S.M. degree. Finally, students in still other areas are divided almost equally between those who pursue the Doctor of Science degree and those who discontinue their studies upon receipt of the S.M. degree.

Occasionally, a student may be admitted to a master's program or to candidacy for a doctoral degree in more than one of the disciplines, if the

program meets the requirements of the respective departments or programs involved. In such instances, the degree conferred specifies the areas.

Because there is considerable variability among the S.M. and S.D. programs in different fields, both in their overall goals and their specific admission and degree requirements, applicants are urged to consult the program descriptions. These descriptions provide basic information about programs in specific areas; additional information may be obtained by contacting the respective departments or programs, as indicated in the degree designation.

Joint Department Degree

With the permission of the departments, students may seek a Master of Science or Doctor of Science degree from two departments within the School.

Master of Science in Specified Field

In general, the programs leading to the degree of Master of Science in a specified field of concentration are designed for students with interests in the scientific basis of public health and preventive medicine. The degree is granted upon fulfillment of a program of advanced work in the public health disciplines represented by departments and certain programs in the School. Students may be admitted to either a one- or a two-year master's program, depending upon the requirements of the particular program. Information about requirements for one- and two-year programs in various areas is included in the program descriptions.

Requirements for Admission

Applicants to Master of Science degree programs must satisfy the Committee on Admissions and Degrees as to their overall qualifications and promise for successful graduate study at the School. Applicants must also satisfy the department or program to which admission is sought that they have an adequate academic and/or professional background appropriate for specialization in that field.

Conditions of eligibility for one-year or two-year programs vary with the area or department in which a student wishes to specialize. Prospective applicants should consult program descriptions for more specific information.

Generally, eligibility for admission to a one-year program is limited to graduates of approved schools of medicine, dentistry, or veterinary medicine, or to applicants who have earned doctoral or, for some programs, master's degrees in fields acceptable to the department(s) to which admission is sought. Applicants holding master's degrees may be considered for admission to one-year or to two-year programs, depending upon their prior educational and professional background and upon the particular requirements of the program to which they wish to apply.

An applicant holding a baccalaureate degree is normally considered for admission to a two-year program, in order to complete the requirements for a Master of Science degree. For a few programs, including industrial hy-

giene, air pollution control, and radiological health, applicants may be considered for a one-year program if they hold a bachelor's degree with adequate scientific and engineering training and if they have had at least two years of relevant professional experience in the field of specialization.

Occasionally, a year or more of appropriate graduate work in an approved institution may enable a student to fulfill two-year program requirements in one year. In some cases, however, program requirements are such that a student must spend one-and-a-half or two years in residence in order to complete the necessary courses, regardless of prior training and experience.

All candidates for admission to a Master of Science program, who do not hold an earned doctoral degree, must submit scores from the Aptitude Test of the Graduate Record Examination*. Applicants who hold an earned doctoral degree are urged to submit scores from the GRE or other tests such as the Law School Admission Test (LSAT), the Medical College Admission Test (MCAT), or the Dental Aptitude Test (DAT), if available.

Applicants are advised to take the Graduate Record Examination no later than the December test administration date. In order to expedite the admissions process, applicants who have taken the Graduate Record Examination in a prior academic year are advised to send a photocopy of their own G.R.E. "Report to the Candidate" when returning their completed application form. GRE scores submitted should be no more than five years old. An official score report must be received from the Educational Testing Service before final action will be taken on the application. Additional information concerning the Graduate Record Examination requirement is included in the instructions accompanying the application form.

Requirements for the Degree

Students admitted to a one-year program must spend a minimum of one academic year in residence at the University and must successfully complete a program of at least 40 credit units. Students admitted to a two-year program must spend two academic years in residence and must successfully complete a program of at least 80 credit units.

While specific course requirements vary from program to program, all candidates for a Master of Science degree are required to take Biostatistics 101a,b and Epidemiology 201a, unless they can demonstrate equivalent preparation. Candidates who do not have a background in medicine or biology are advised to take Physiology 203a,b, or its equivalent, or a course in general biology elsewhere. Beyond these minimal course requirements, each program may specify additional courses that are necessary for satisfactory fulfillment of degree requirements in the particular area of specialization. These specific course requirements are generally *not* listed in this catalog. The student should consult with his or her adviser or department or program head about these requirements before deciding which courses to take.

Combined Degree Programs

The admission and degree requirements for the Master of Science degree are the same those listed for Master of Public Health degree.

*For exception to this, see Department of Health Policy and Management.

Doctor of Science in Specified Field

The Doctor of Science degree is an advanced graduate degree for those who intend to pursue academic or research careers in public health. The degree is granted on successful completion of a program of independent and original research in one of the basic disciplines of public health, and upon the presentation of this research in an acceptable thesis.

Requirements for Admission

Applicants for admission to candidacy for a Doctor of Science degree must satisfy the Committee on Admissions and Degrees and the department of specialization as to their overall qualifications for doctoral study and their ability to undertake original research in their chosen field. All candidates for a Doctor of Science degree must hold a baccalaureate degree. In some instances, an applicant will be expected to complete the Master of Science degree at the School before being granted full admission to doctoral study. In such cases, the student will first be admitted to a Master of Science program. Scores for the Aptitude Test of the Graduate Record Examination must be submitted by all applicants to doctoral programs, who do not hold earned doctoral degrees, and should be no more than five years old. Applicants who hold an earned doctoral degree are urged to submit Aptitude Test scores from the GRE, or LSAT, MCAT, or DAT tests, if available.

Because specific prerequisites vary with the discipline or field of specialization, prospective applicants are urged to consult the program descriptions in this catalog and the department or program to which admission is sought for more detailed information.

Requirements for the Degree

A minimum of two academic years of full-time study in residence at the University is required of students enrolled in the doctoral program. The required work and preparation of an acceptable thesis, however, frequently takes longer. Residence requirements are fulfilled by payment of tuition (see p. 70,72) and pursuit of an academic program approved by the department of concentration and the Committee on Admissions and Degrees.

The Committee on Admissions and Degrees is responsible for overseeing the programs of all doctoral students. During the registration period each new doctoral student will receive a manual detailing the principles and procedures that are to be followed. A brief summary of requirements is given below.

Each doctoral student is required to take 40 to 60 credits in graduate-level courses distributed over a major and two minor fields. Each minor field will ordinarily consist of at least 10 credits in formal courses. Such requirements may be reduced in cases of prior relevant coursework or experience. They may be increased in cases where there has been a substantial shift in field. Courses in the major and minor fields must be completed with distinction, with grades of "A" or "B." Departments may stipulate specific course requirements and may require written and/or oral examinations on the coursework in the three fields.

Qualifying Examination

By the end of the second year the student should be prepared to take the oral qualifying examination. The main emphasis of this examination is to assess the student's potential to perform research in his/her chosen field. Since most doctoral research in the School requires a substantive knowledge of more than one discipline or field, the examining committee will include faculty from disciplines representing the minor fields as well as the major. The examination will include questioning in the major and minor fields outside of the proposed research.

A research committee consisting of the student's adviser and other faculty members is to be appointed within one month after the qualifying examination is passed. This committee has the responsibility for guiding the student's research through to completion. It will meet with the student at least once every six months to discuss details of the student's progress.

Thesis

An acceptable thesis must ordinarily be submitted within five years of the date of registration as a doctoral candidate. The thesis should consist of one or more manuscripts suitable for publication in a scientific medium appropriate to the candidate's field. Detailed requirements are available from the Registrar.

The thesis will not be accepted until a public presentation and discussion has been held, with the research committee in attendance.

Three bound copies of the approved thesis must be in the Registrar's Office before the faculty will vote the degree at its special meetings in October, February, or May.

Occasionally thesis work will be performed *in absentia*. Before the doctoral subcommittee of the CAD grants such status, it is necessary that the research committee meet with the candidate to appraise the thesis plan. Agreement must be reached and the doctoral subcommittee must be advised in writing *before departure of the student* as to (1) acceptability and feasibility of the proposed thesis plan; (2) the timing and scope of the periodic written reports that will be required of the student; (3) arrangements that have been made or will be made for direct field supervision of the student; and (4) the minimum period of time the student will spend back at the School before the presentation and defense of the thesis. In no case will the doctoral subcommittee grant *in absentia* status for more than one year at a time.

Students wishing further information on doctoral program requirements should contact the Registrar's Office.

Residency for Board Certification

The School offers approved residency training leading to certification by the American Board of Preventive Medicine in the following areas:

General Preventive Medicine, in the specialty areas of
- Epidemiology
- Health Services Administration
- International Health

Occupational Medicine

For physicians who apply and who are accepted into a General Preventive Medicine or Occupational Medicine Residency, credit is given for one or two years of study leading to one or more public health degrees. A residency may also include supervised experience which may or may not be part of a doctoral program.

Additional information about the residency programs may be obtained from Dr. Brian MacMahon, Head of the Department of Epidemiology (for the specialty area of epidemiology of the General Preventive Medicine residency); Dr. Alonzo Yerby, Professor of Health Services Administration (for the specialty area of health services administration of the General Preventive Medicine residency); Dr. Manuel Herrera-Acena, Associate Professor of Medicine in the Department of Nutrition (for the specialty area of international health of the General Preventive Medicine residency); and Dr. David Wegman, Associate Professor of Occupational Medicine (for the Occupational Medicine residency).

None of the residencies as such involves stipend or other financial support. Some financial support may be available through traineeships or National Research Service awards for degree programs (U.S. citizenship or permanent residence status required). Further information on financial aid can be obtained from the individuals listed above, or from Ms. Margaret C. Salmon, Director of Financial Aid.

Postdoctoral Fellowship Program in Dental Public Health and Dental Care Administration

The School of Dental Medicine, in cooperation with the School of Public Health and the Massachusetts Department of Public Health, offers a program covering three academic years of postdoctoral study, intended to prepare a limited number of individuals for creative full-time teaching, research, and/or administrative careers in dental public health and dental care organization. Each person accepted into the program will be appointed as a Clinical or Research Fellow in Dental Care Administration at the School of Dental Medicine. The program is open to dentists and other qualified health professionals.

The program is in three parts of approximately one year each, which need not be completed in succession. One part of the program involves a formal course leading to a degree of Master of Public Health. The M.P.H. core courses must be completed in the first year at the School of Public Health

and all requirements for the Master of Public Health degree in a maximum of two academic years. Candidates with an M.P.H. or equivalent from another school, however, may be accepted into the Postdoctoral Fellowship Program with one year advanced standing. The second portion involves a one-year supervised residency at the community, state, or national level in health policy and administration. This residency meets the requirements of the American Board of Dental Public Health. The third portion affords opportunity for advanced didactic work and research at the School of Dental Medicine, the School of Public Health, other departments of the University, and/or other institutions. Epidemiological or health services research can be carried on over the entire three-year period in a variety of situations involving either new or continued studies. A research thesis is prepared for presentation at the end of the third year.

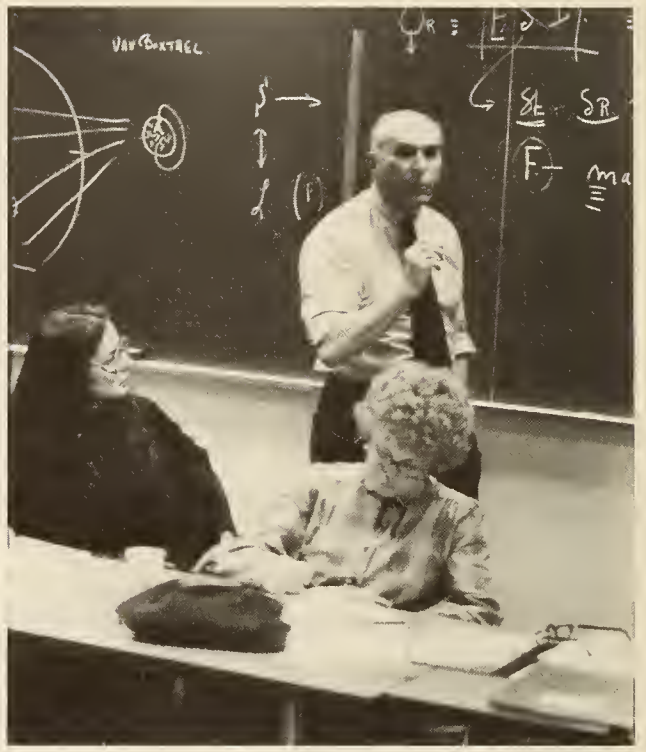
Fellows in Dental Care Administration who wish to become candidates for a degree in public health must meet the admission requirements of and be accepted into the School of Public Health. Application should be made directly to the School of Dental Medicine, whose Committee on Postdoctoral Education will forward the applicant's file to the School of Public Health for consideration.

Upon successful completion of this program, the candidate will receive the M.P.H. degree from the School of Public Health, as well as a Certificate of Postdoctoral Study in Dental Care Administration and a certificate of completion of residency requirements from the Harvard School of Dental Medicine.

Academic study beyond the master's level may be arranged with the School of Public Health and other departments of the University.

For further information and application forms, write to the Head, Department of Dental Care Administration, Harvard School of Dental Medicine, 188 Longwood Avenue, Boston, Massachusetts 02115.

Members of the Executive Committee for Health Policy and Management meet with Dean Blout to discuss policies for the next year. From left, clockwise, are Dr. Frazier, Dr. Yerby, Professor Curran, Dr. Roberts, and Dr. Blout.



Dr. Mertens of Behavioral Sciences lectures on "Inducing Social Change."

Reviewing the Core Curriculum of the Master of Public Health Program are its coordinators, from left to right, Dr. Boyer, Dr. Drolette, Dr. Yerby, and staff assistant, Fay Kimball.

Departments and Programs

Department of Behavioral Sciences

William E. McAuliffe, A.B., A.M., and Ph.D., Associate Professor of Sociology and Acting Head of the Department

Faculty

Professor and Visiting Professor Hamburg and Mertens; Associate Professors Benfari and Masnick; Assistant Professors Gortmaker, McAlister, Radius, and D. Walker; Lecturer Wechsler

Teaching and Research Staff

Research Associate/Lecturer Eaker and Eckenrode; Lecturer Ockene

Introduction

The Department of Behavioral Sciences seeks to train researchers, teachers and professionals in the knowledge and analytical skills of the behavioral sciences relevant to significant public health issues. The specific focal points for teaching and research are: (1) the influences of behavior on health and disease; (2) behavioral aspects of health services, including psychosocial factors affecting the utilization of services and compliance with medical regimens, as well as the behavior of health professionals; (3) behavioral pathologies including addiction to drugs and alcohol, mental illness and child abuse; and (4) social science methodologies as applied to public health problems and the evaluation of health services and programs.

Degrees

Master of Public Health with concentration in Behavioral Sciences; and Master and Doctor of Science in Behavioral Sciences.

Research

The Harvard unit of the nationwide Multiple Risk Factor Intervention Trial (MRFIT) reached the halfway point in the 10-year testing of the hypothesis that mortality from coronary heart disease can be reduced by altering the risk factors of elevated blood pressure, elevated blood cholesterol and cigarette smoking. Results of intervention efforts thus far show substantial reductions in all three risk factors.

A project entitled "Field Study of Youth Health Promotion Processes" is being conducted to determine how unhealthy life-styles are adopted and what interventions can prevent the onset of smoking, alcohol and drug abuse. It is being implemented in inner city schools and suburban schools in Boston and in two small towns in California in collaboration with researchers at Stanford University.

The Harvard Community Child Health Studies is a multidisciplinary research and evaluation project in three communities (Flint, Michigan, Cleveland, Ohio, and Berkshire County, Massachusetts), designed to examine many policy-relevant issues related to the identification of child health problems as well as the design and implementation of programs and policies to meet child health needs.

Research on medical sociology: studies on ethnic variations in response to health care, with special attention to consumer satisfaction are being

Some of the courses that the Department offers are listed below. The corresponding descriptions are on page 90.

Health and Behavior; Sociological Perspectives in the Study of Health Attitudes and Behaviors; Inducing Social Change; Health Promotion; Change of Health Behaviors; Behavior Analysis; Implementation of Intervention Programs; Psychiatric Epidemiology; Psychiatric Problems in Organization and Industry; Drug Addiction; Methods of Social Research: Design and Measurement; Methods of Social Research: Data Collection and Analysis; Tutorial Programs; and Research Training.

In conjunction with other departments: The American Household in Demographic Perspective; and Child Development and Social Policy.

undertaken. Other projects include the study of patient compliance with medical regiments and the genesis of children's health beliefs and behaviors.

Research on opiate addiction among street addicts, medical professionals and medical patients is also underway. The efficacy of self-help groups in preventing relapse in heroin addicts is being experimentally evaluated in Boston and Hong Kong. The study also seeks to learn the causes of relapse and how treatment programs may be improved.

A research project entitled "Support Systems, Stress and Primary Health Care" is funded by the National Center for Health Services Research. This prospective study seeks to assess the role of stress and social support systems in the utilization of primary care health services at a neighborhood health center in Boston.

Surveys of special populations, particularly teenagers and young adults, are being conducted with regard to patterns of alcohol consumption, drug use, and related behaviors.

Programs

Goals

Designed to train persons to perform significant research on behavioral aspects of health and health services. Students learn research skills, techniques of applying behavior sciences to public health issues, and relevant elements of behavioral disciplines.

Curriculum

Students take introductory and advanced courses in statistics, research methods, and epidemiology. Research training is also gained by participation in the faculty's research projects. Course work is done in areas of health and behavior, behavioral aspects of health services, and behavioral pathologies. (See p. 9 for specific degree requirements.)

Admission

Applicants for the doctoral program must have a baccalaureate degree and preferably an advanced degree in a related behavioral science discipline or medicine. These individuals are admitted directly into the doctoral program. Applicants for the master of science program should ordinarily have a doctoral degree.

Career Outlook

Recent graduates have taken research and teaching positions in major health institutions and academic settings.

Department of Biostatistics

C. Frederick Mosteller, S.B., S.M., A.M., Ph.D., S.D. (hon.), Roger Irving Lee Professor of Mathematical Statistics and Head of the Department

Faculty

Professors Drolette, Miettinen, Reed, Weinstein, and Zelen; Associate and Visiting Associate Professors Lagakos, Louis, Pagano, S. Shapiro, and Ware; Assistant Professors Begg, Costello, H. Feldman, Feldstein, Gelber, Gelman, Hanley, Laird, Lavin, MacIntyre, Mehta, Neff, Schoenfeld, Stanley, Thibodeau, and Waternaux; Lecturers Bailar and Kent

Teaching and Research Staff

Research Associate Lew

Introduction

The Biostatistics program is designed to prepare students for careers in the application of statistical and mathematical methods to the design and analysis of health research studies, and to the planning and evaluation of health services programs. Twenty-eight faculty participate in this program, which includes training in research, collaboration, and teaching. The graduate program offers four advanced degrees — three Master of Science degrees and the Doctor of Science degree.

Degrees

Master and Doctor of Science in Biostatistics; and Joint Department Master of Science.

Research

As part of the advanced degree program, all students work with faculty on ongoing projects in methodological research activities and scientific collaborations. In the area of methodological interests, faculty conduct research in data analysis, biometry, experimental design, multivariate methods, stochastic processes, pattern analysis, statistical computing, data base management, computer science, health policy, and cost-benefit analysis. In the area of collaboration, personnel are engaged in coordination of national clinical trials, FDA investigations, studies of institutional variation in burn patients, design of dental health surveys, environmental health, analysis of childhood growth patterns, in addition to projects in the Department Consulting Service. The Department also conducts a surgery study group and seminar series.

Programs

The majority of candidates are enrolled in Master of Science programs.

Goals

All the degree programs will train students in the following areas: (1) the use of numerical data as a basis for drawing conclusions and development of logical plans based on these conclusions; (2) the use of statistical methods in formulating problems, planning studies, conducting analyses, writing reports; and (3) the development of skills needed to collaborate and communicate effectively with scientists in related disciplines.

Dr. Waternaux speaks on "Statistical Methods in Research."

The doctoral program has the following additional objectives: (1) the development of statisticians capable of conducting independent methodologic research; and (2) the training of statisticians capable of providing scientific leadership.

The courses offered by the Department of Biostatistics are designed to meet three specific needs.

First, it is essential for workers in all branches of public health to be able to draw conclusions from numerical data and to base logical action on these conclusions. This applies to the administrator who must evaluate problems and the results of his or her activities, as well as to the epidemiologist and the research worker who must apply statistical techniques to their laboratory and field problems. The course Biostatistics 101a,b is designed to give a basic command of simple methodology to all students, an appreciation of the value of the method, and an awareness of the frequent abuse encountered in the health literature.

Second, field and laboratory researchers must be able to use statistical methods in planning and analyzing their experiments. Some elective courses are designed to provide an introduction to methodology in this area. These courses are adapted to the needs of students of this School, many of whom have broad backgrounds in biological sciences while few have extensive preparation in mathematics. A minimum of mathematical exposition is therefore included in some courses intended for students in these categories. Other electives go into greater depth in particular topics. In all electives, the emphasis is on understanding the underlying assumptions inherent in standard statistical procedures and on the ability to determine when such procedures are appropriate.

Third, there is the group of students conducting graduate work in biostatistics. To meet the needs of these students, the Department offers courses coordinated with the Department of Statistics at Harvard and the Department of Mathematics at Massachusetts Institute of Technology. Specialized courses are given in data analysis, biometry, experimental design, multivariate methods, stochastic processes, statistical computing, data base management, and computer science.

Curriculum

Two-Year Master of Science

This program is intended for candidates with no prior graduate degree. Candidates should have had two semesters of calculus and one semester of linear algebra. Each student must spend two academic years in residence and complete courses totaling a minimum of 80 credit units. At least 40 credit units must be taken in approved statistics and epidemiology courses. The remaining credit units may be electives in the basic health sciences. Training shall include practical experience in teaching, data analysis, and computing.

One-Year Master of Science
This program is directed towards those students with a previous graduate degree in a medical, scientific or statistical field. Candidates should have had two semesters of calculus and one semester of linear algebra. Each student must spend one academic year in residence and complete courses totaling a minimum of 40 credit units. At least 32 credit units must be taken in approved statistics and epidemiology courses. Training shall include practical experience in data analysis and computing.

Joint Department Master of Science
This program is directed towards those students seeking a Master of Science from two departments within the School of Public Health. Candidates should have had two semesters of calculus and one semester of linear algebra. Students must take at least 32 credit units in biostatistics and epidemiology to satisfy the Department of Biostatistics requirements, with remaining credit units allocated to satisfying the S.M. degree requirements for the other department. Training shall include practical experience in data analysis and computing.

Doctor of Science
This program is designed for students seeking a doctoral degree. Candidates are required to have had two years of calculus and one semester of linear algebra and must submit Graduate Record Examination Aptitude test scores. Students with particularly strong backgrounds may be admitted directly to this program, while other students may be admitted subsequently, pending satisfactory completion of the Master of Science program. Each student must spend two academic years in residence and complete courses totaling a minimum of 80 credit units. Training shall include practical experience in teaching, data analysis, and computing. Any work completed at the School of Public Health towards a Master of Science degree may be applied to the Doctor of Science degree.

Further requirements include: (1) completion of a major in biostatistics (40 credit units) and a minor in mathematical statistics; (2) completion of a second minor (10 credit units) in a health-related area; (3) completion of a two-part qualifying examination; and (4) completion of a doctoral thesis.

Admission
Please see specific degree requirements on p. 13.

Career Outlook
The career outlook for biostatisticians is very promising. Biostatistics graduates have secured positions in government, universities, industry, and public health centers. Statisticians are needed in the broadly defined areas of medical care, drug therapy, health maintenance, environmental control, and health care administration. The 1978 report on professional employment needs, issued by the National Academy of Science, indicated a critical shortage of biostatisticians and epidemiologists with graduate degrees. This report also noted that shortages were likely to continue for the next five years.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 92.

Principles of Biostatistics; Biostatistics for Medical Investigators; Statistical Methods in Research; Mathematical Foundations of Biostatistics; Survey Research Methods in Community Health; Advanced Topics in Biostatistics; Discrete Multivariate Analysis; Computing Principles and Methods; Principles of Clinical Trials; Health Program Evaluation; Probability Theory and Applications; Statistical Inference; Multivariate Analysis for Quantitative Data; Design of Experiments; Data Analysis; Theory of Biometry I; Theory of Biometry II; Regression and Analysis of Variance; Stochastic Processes in Medicine and Biology; Computer Programming; Introduction to Computing; Statistical Computing; Applied Data Management; Tutorial Programs, and Research.

Courses offered in conjunction with other departments are listed below.

Statistical Methods for Health Policy and Management; Forecasting and Its Use in Health Programs and Institutions; and Analysis of Health and Medical Practices.

Department of Environmental Health Sciences

Dade W. Moeller, S.B., S.M., Ph.D., A.M. (hon.), Professor of Engineering in Environmental Health and Head of the Department

Faculty

Professor First; Associate Professors Burgess, Dennis, Hinds, and Smith; Assistant Professors Cooper, Keyserling, D. H. Leith, and Spengler; Lecturers Bjarngard, Cudworth, Judy, J. Shapiro, and Webster

Teaching and Research Staff

Lecturers and Visiting Lecturers Anderson, Billings, Bracken, Egan, Jaeger, Mahoney, Nelson, Selby, Svensson, Viles, and Zimmerman; Research Associates Dockery and Wolfson

Introduction

With growing public awareness of the need for environmental pollution control and worker protection, increasing attention is being focused on these problems at all levels of our society. There are five specialized programs offered by the Department of Environmental Health Sciences. Although an occasional student is admitted to a general program in environmental health sciences, for which courses may be planned to suit individual student interests and career goals, the majority of the students elect one of the specialties listed below. In addition to specialized courses, graduate education in each of these fields includes courses on human physiology, epidemiology, and biostatistics.

The Department requires that students take all Environmental Health Sciences and core program courses under the ordinal grading system. Exceptions are the Departmental Seminar and tutorial courses which are graded Pass/Fail.

The Department particularly welcomes inquiries concerning its doctoral programs. Candidates selected for these programs include outstanding S.M. degree graduates from within the Department as well as applicants who have received masters degrees from other institutions. On a limited basis, candidates with exceptionally good records at the bachelor degree level may be accepted directly into the Department's doctoral program.

Degrees

Master and Doctor of Science in Environmental Health Sciences. Generally, students who enter the program immediately after completing the baccalaureate degree enroll in the Master of Science program. Upon completion of the Master of Science program, they may continue for a doctoral degree.

Requirements

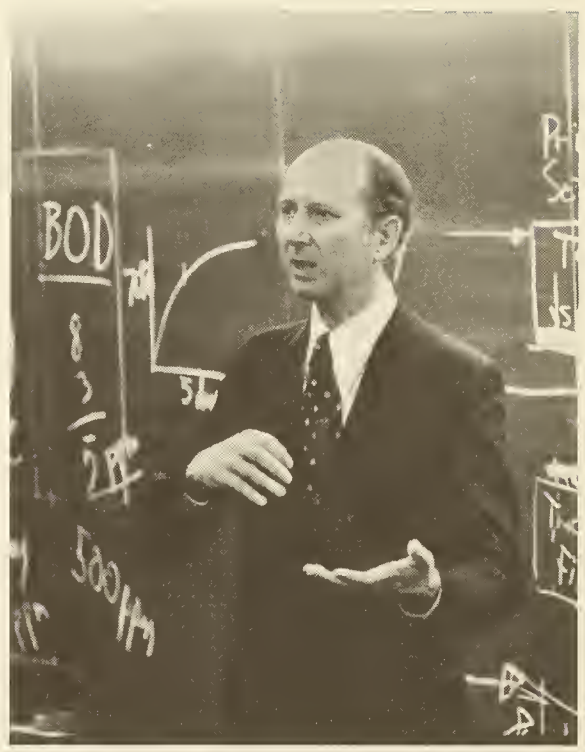
Problem analyses and the evaluation and reporting of such analyses are expected to be major components of the work of health professionals who graduate from these programs. To assure the development of these skills, each student accepted into a two-year master's program will be required to conduct an appropriate research or related study and to present a written report on it at an acceptable professional level. Such studies and the associated reports will generally be completed during the second year of the

program. The minimum time devoted to this effort will be five credit units per semester, for a total of ten credit units.

Please see p. 13 for specific degree requirements.

Research

Supporting the teaching program are extensive research activities. Current studies include the evaluation of the exposures of workers to air contaminants, development of improved engineering controls for exposures to toxic materials, assessment of the environmental impact of nuclear facilities, medical radiation applications and dosimetry, the design of cleanup systems for radioactive sodium aerosols, the application of gas- and liquid-phase reactions to particulate and gas removal, a numerical study of urban scale atmospheric transport, and an investigation of the population dose from radiation of natural origin. Supporting these studies are related cooperative research projects conducted by the Departments of Physiology and Epidemiology. As a result, students have many excellent opportunities for research, either on an independent basis or as a participant in an ongoing project.



"Principles of Environmental Health" is the course given by Dr. Moeller, Head of the Department.

Programs

Air Pollution Control

Goals

To provide preparation in the sciences basic to understanding air pollution research and control activities.

Curriculum

Generally includes courses in community air pollution, meteorological aspects of air pollution, identification and measurement of air contaminants, air and gas cleaning, and aerosol technology.

Admission

Acceptable candidates for the program normally have a bachelor's degree in engineering, chemistry, mathematics, biology, or physics. Although the S.M. degree usually requires two years to complete, students with prior master's degrees and with training or experience in related areas, may be able to complete the program in one year. Some students continue toward the Doctor of Science degree.

Career Outlook

Recent graduates have taken positions with federal, state, or local regulatory agencies, with consulting firms, with industry, or with universities.

Industrial Hygiene

Goals

The master's program is designed to meet the demand for professional personnel with the skills and scientific knowledge that are needed to identify and control health stresses associated with the working environment — e.g., air contamination, noise, radiation, heat, pressure, etc.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 95.

Environmental Health Interdepartmental Courses

Principles of Environmental Health; Human Factors in Occupational Performance and Safety; Current Topics in Occupational Health and Safety; Occupational Medical Clinics; Policy Issues in Occupational Health; Mathematical Modeling for Health Sciences; Critical Review of the Scientific Basis for Occupational Standards; Occupational Safety Science; Basic Problems in Occupational Health and Industrial Environments; Introduction to Industrial Hygiene; and Field Work.

Environmental Health Sciences

Departmental Seminars; Introduction to Environmental and Health Management; Environmental Control: Industrial Ventilation; Noise and Vibration Control; Aerosol Technology; Health Hazards of Manufacturing Processes; Community Air Pollution; Meteorological Aspects of Air Pollution; Identification and Measurement of Air Contaminants; Air and Gas Cleaning; Introduction to Radiation Protection; Introduction to Radiation Instrumentation; Advanced Topics in Radiation Protection; X-ray Protection; Introduction to Physics of Diagnostic Radiology; Introduction to Physics of Nuclear Medicine; Introduction to Physics of Radiation Therapy; Physics of Diagnostic Radiology; Physics of Nuclear Medicine; Physics of Radiation Therapy; Tutorial Programs; and Research.

Curriculum

Generally includes recommended and required courses dealing with basic problems in occupational health and industrial environments, policy issues in occupational health, environmental control, identification and measurement of air contaminants, air and gas cleaning, principles of toxicology, human factors in occupational performance and safety, and aerosol technology.

Admission

Acceptable candidates for the program normally have a bachelor's degree in engineering, chemistry, physics, or biology. Although this is primarily a two-year program, students with master's degrees in the above disciplines and some students with prior training or experience in related areas may be able to earn the S.M. degree in one year. It is a terminal program for most students, although a few continue toward the Doctor of Science degree.

Career Outlook

Recent graduates have taken positions with federal, state, or local regulatory agencies, with consulting firms, with industry, or with universities.

Environmental Health Management

Goals

To train professional public health personnel to manage environmental health problems, particularly in urban areas.

Curriculum

Multidisciplinary program which draws upon courses offered by the Harvard School of Public Health, by other faculties of Harvard University, and by the Massachusetts Institute of Technology. In addition to the basic course in environmental health management, students normally take a series of courses in air pollution control, industrial hygiene, radiological health (specialty areas offered through the Department of Environmental Health Sciences), or water pollution control (offered through the Division of Applied Sciences of the Graduate School of Arts and Sciences), supplemented by electives in environmental economics, public health administration, political and social sciences, environmental law, environmental planning, and health education.

Admission

Students admitted to the program normally hold a bachelor's degree in biology, engineering, geology, or another science. This program is usually two years in length and generally includes a field training assignment with an environmental health agency during the summer. Selected opportunities for continuing toward the doctoral degree are open to qualified recipients of the S.M. degree.

Career Outlook

Recent graduates have taken administrative or regulatory positions in environmental health.

Medical Radiological Physics

Goals

To provide students with a large portion of the knowledge and experience necessary for the practice of radiological physics in a hospital and for certification by the American Board of Radiology.

Curriculum

The program utilizes the resources of the Harvard teaching hospitals in collaboration with the recently established Harvard-M.I.T. Program in Health Sciences and Technology. The curriculum draws upon courses within that program as well as courses offered within the Harvard School of Public Health. A typical curriculum includes recommended and/or required courses in radiation protection, radiation biology, X-ray protection, and physics in diagnostic radiology, nuclear medicine, and radiation therapy.

Admission

Program trainees normally have prior bachelor's or master's degrees in physics and mathematics. Most students are able to earn the S.M. degree in two years. Approximately half of the graduates continue toward the doctoral degree.

Career Outlook

Recent graduates have taken positions principally as radiological physicists either in health-care settings or in research.

Radiological Health (Radiation Protection)

Goals

To provide students with knowledge of the fundamentals of radiation protection. Considerable attention is given to the effects of environmental releases of radioactive materials, and the associated requirements for complying with regulations and standards.

Curriculum

Includes recommended and required courses covering radiation protection, radiation biology, X-ray protection, aerosol technology, and radiation dosimetry.

Admission

Students admitted to the program normally have bachelor's or master's degrees in physics, mathematics, or engineering. Two years are normally required to earn the S.M. degree, although some students with prior training and/or experience in relevant areas may earn the degree in one year. About half the students continue toward the doctoral degree.

Career Outlook

Recent graduates have taken positions with the nuclear power industry, hospitals, universities, research institutions, governmental regulatory agencies, and consulting architectural or engineering firms.

Courses in conjunction with other departments: Political Economy of Environmental Health Regulations and Environmental Health Policy Analysis.

Department of Epidemiology

Brian MacMahon, M.B., Ch.B., D.P.H., Ph.D., S.M. in Hyg., M.D., Henry Pickering Walcott Professor of Epidemiology and Head of the Department

Faculty

Professors Hutchison and Miettinen; Associate Professors Monson, Morrison, and Rothman; Assistant Professors Gutensohn, A. Walker, and Willett; Lecturers Ellison and R. Shapiro

Teaching and Research Staff

Lecturers and Visiting Lecturers Boice, Cole, Feinleib, Jick, Miller, Paffenbarger, Sartwell, and Warram; Research Associates Finkle, Jimi, and Yen

Introduction

The major objective of the Department is to provide opportunities for training and experience in the application of epidemiologic research methods to the investigation of diseases of unknown etiology. Emphasis is on the cardiovascular disorders, the malignant neoplasms, abnormalities of reproduction and development, and other major diseases for which preventive measures are still unknown or inadequate.

Degrees

Master and Doctor of Science in Epidemiology; and Doctor of Public Health.

Research

An international study of newly diagnosed cases of bladder cancer is investigating differences between these cases and comparison groups who do not have cancer. Factors of major interest as possible causes of bladder cancer include exposure to industrial chemicals, cigarette smoking, and use of saccharin and other non-nutritive sweeteners.

In a study of congenital heart disease, associations between 13 categories of drugs and various types of these diseases were described. Many of the associations were reported for the first time.

Study of pregnancies in nearly 20,000 women produced no evidence of an increase in risk of birth defects after oral contraceptive use except for undescended testes. In a related study, women were found to give birth to twins more frequently after oral contraceptive use.

Employment in the rubber industry is being studied as a possible factor leading to abnormalities of the fetus.

Thyroid disease is under investigation as a condition possibly associated with an unusual subsequent risk of cancer.

A recently completed study showed a sharply increased risk of breast cancer in young women who had received radiation to the breasts during teen and young adult ages. An expanded study is now investigating this hazard in greater depth.

A clinical trial is being started to evaluate three methods of treatment of infants with respiratory distress syndrome and patent ductus arteriosus.

A series of studies of Hodgkin's disease are investigating disease clusters, familial patterns, associated viral infections, effect of radiotherapy in disease management, and late development of leukemia as a complication of radiotherapy or chemotherapy of Hodgkin's disease.

Programs

Goals

The master's program is intended to provide students with basic skills in epidemiologic and quantitative methods and in computing, in preparation for research careers. The doctoral programs are designed for persons who plan careers of research or teaching in epidemiology.

Curriculum

The one-year research training program for the S.M. degree includes most of the courses offered by the Department, plus courses in principles of biostatistics, statistical methods in research, and computing principles and methods (which are offered by the Department of Biostatistics), a total of 25 to 30 credit units. Additional formal courses in areas of special interest and/or supervised research comprise the remainder of the program. The S.D. program is of four to five years' duration for persons holding baccalaureate degrees; for persons holding relevant master or doctoral degrees, however, the program is shorter, usually two to three years in length. Unless course work equivalent to that described above for the S.M. degree has been taken previously, most of the first two years of a doctoral program is occupied with courses. Subsequently, completion of a thesis and experience as a teaching assistant are the principal components. The content of the Dr.P.H. program is identical to that of the S.D. program and will vary in length, usually from two to five years, depending on the individual's background and progress with the thesis component. (Please see p. 12 for more specific degree requirements.)

Residency

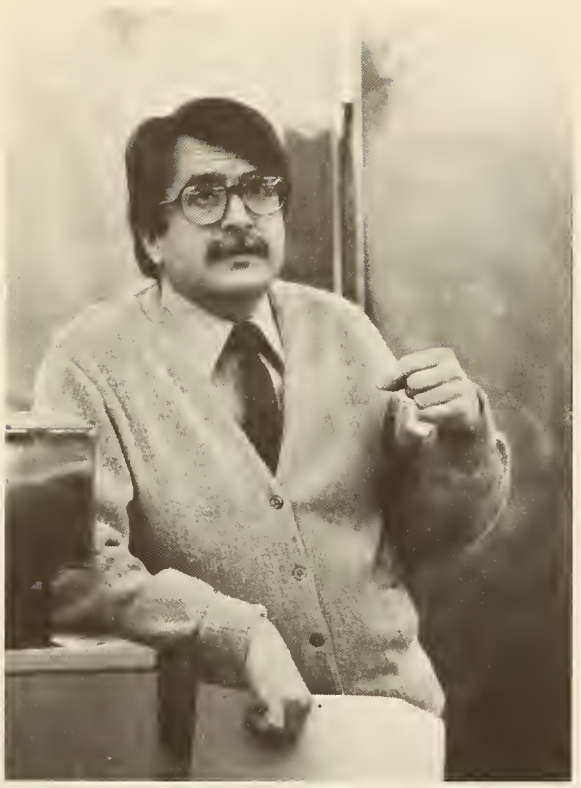
A three-year residency in the Department has been approved as satisfying residency requirements of the American Board of Preventive Medicine for certification in General Preventive Medicine. Requirements of the approved residency and of the School's degree programs may be satisfied simultaneously. The residency does not satisfy the one-year clinical component required by the American Board of Preventive Medicine.

Admission

Acceptable candidates for the S.M. program are physicians, veterinarians, and dentists. For qualified students the period of research training may be extended by admission to either of the doctoral programs offered by the School, or by admission to special student status. Most of the training beyond the master's degree is occupied in supervised research experience. Potential doctoral candidates must plan at least two years in residence beyond completion of the master's degree. For most students in the program, the S.M. degree is considered terminal. The Department considers

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 100.

Introduction to Epidemiology; Principles of Epidemiology I: Elements of Study Design and Data Analysis; Principles of Epidemiology II: Problem Conceptualization and Study Design; Principles of Epidemiology III: Data Analysis and Interference; Practice of Epidemiology; Seminars; Topics in the Theory of Epidemiology; Epidemiology of Chronic Disease: Psychiatric Diseases; Epidemiology of Chronic Disease: Cancer and Screening; Epidemiology of Chronic Disease: Cardiovascular and Respiratory Disease; Environmental Epidemiology; Tutorial Programs; and Research.



Dr. Monson poses a question to his class in "Environmental Epidemiology."

applications for direct admission to doctoral candidacy (S.D. degree) from persons holding baccalaureate degrees with strong backgrounds in biology and mathematics; it also encourages candidates holding other master and doctoral degrees.

The Dr.P.H. program is available to persons holding the M.P.H. degree.

Career Outlook

Some of the positions recent graduates have taken: Officer in Epidemiologic Intelligence Service, Center for Disease Control; epidemiologists at the National Cancer Institute; and appointments at universities and medical schools in research and instruction.

"Who Is at Highest Risk of Cancer?" was the topic of the departmental seminar given by Dr. Li.

Department of Health Policy and Management

Members of the Executive Committee
William J. Curran, J.D., LL.M., S.M. in Hyg., Frances Glessner Lee Professor of Legal Medicine in the Faculty of Medicine and the Faculty of Public Health; Howard S. Frazier, M.D.; Marc J. Roberts, Ph.D., Professor of Political Economy; and Alonzo S. Yerby, M.D., M.P.H., Professor of Health Services Administration

Faculty
Professors Herzlinger, Reed, and Rosenkrantz; Associate Professors Fineberg, Hsiao, Nesson, Sheldon, Stason, and Young; Assistant Professors Barrett, P. Feldman, Hemenway, Palmer, Taylor, and Thompson; Lecturers Braun, Brown, Kasten, Segall, Sherman, Trevelyan, and Yacovone

Teaching and Research Staff
Lecturers and Visiting Lecturers Allen, Bander, Beraducci, Bishoff, Bloem, Blumenthal, Burchfield, Bycoff, Cloherty, Cohen, Cotton, Crampton, Cupples, Densen, Douglass, Dull, Field, Holden, Irish, Johnson, Keith, Komaroff, Koplan, Landy, Liang, Lorch, Marra, Meehan, Morris, Munier, Nighswander, Pyle, Rabkin, Rosenthal, Sands, Schauffler, Shapiro, Shepard, Smith, J. Taylor, Wathne, and Winsten; Instructors Berwick, Dumbaugh, Hourihan, and O'Brien

Introduction
The Department includes the Graduate Program in Health Policy and Management, the Division of Health Services Administration, and the Executive Programs in Health Policy and Management.

Graduate Program in Health Policy and Management

The Graduate Program is designed to address the need for well-trained policy analysts, planners, regulators, and managers to work within the U.S. health care system. The Program has been designed around four key elements: 1) a dual focus on policy and management; 2) an emphasis on both skills and concepts; 3) a grounding in general health care issues; and 4) a curriculum combining academic and clinical activities.

The Program is based on the premise that training in an academic setting must be complemented by experience in real world, problem-solving situations. The curriculum is updated constantly and is applied to real world situations by means of a required internship program and an applied research project.

Degrees
Master of Science in Health Policy and Management (two-year program); Master of Public Health with concentration in Health Policy and Management (one-year option for Medical/Dental Track students).

Curriculum
The curriculum for the Health Policy and Management Program has been carefully tailored to reinforce the above-described philosophy. There are four important and interrelated elements:

Required Core

A set of required core courses comprise the first year of each student's two-year program. These core courses provide the basic analytic skills and knowledge, needed by professionals serving in both policy and management roles in the health field. Subjects covered include: health care issues and institutions, epidemiology, biostatistics, financial management, organizational behavior, management control, economics of health care institutions and the health care system, political and bureaucratic analysis of health care, quantitative methods and sociological and historical perspectives of health. Students may be exempted from those core requirements in which they demonstrate prior proficiency.

Summer Internship

A required summer internship between the first and second years allows students to apply the skills and knowledge gained from the first year and to acquire further understanding of career possibilities in the health care field.

Flexible Second-Year Curriculum

A flexible second-year curriculum is designed by each student in conjunction with his or her academic and clinical advisors. Maximum flexibility is provided in order to allow each student to pursue his or her own particular area of interest as fully as possible.

In the second year, each student's program of study concentrates on one of two primary skill areas (either policy or management) and in a single, substantive health area (such as health services, nutrition, environment, international health, or population). Diverse course offerings allow students to develop expertise in their primary area of concentration. As part of their second-year applied research seminar, each student prepares a paper which analyzes a specific problem within the selected substantive health area.

Special tracks for physicians and dentists and those interested in environmental health are currently offered.

The Environmental Health Track differs from the above curriculum in that the health care issues and institutions core course is replaced with an environmental issues course. There are also environmental health policy and management courses in the second year, and field placements are being developed to meet the specific needs of this group.

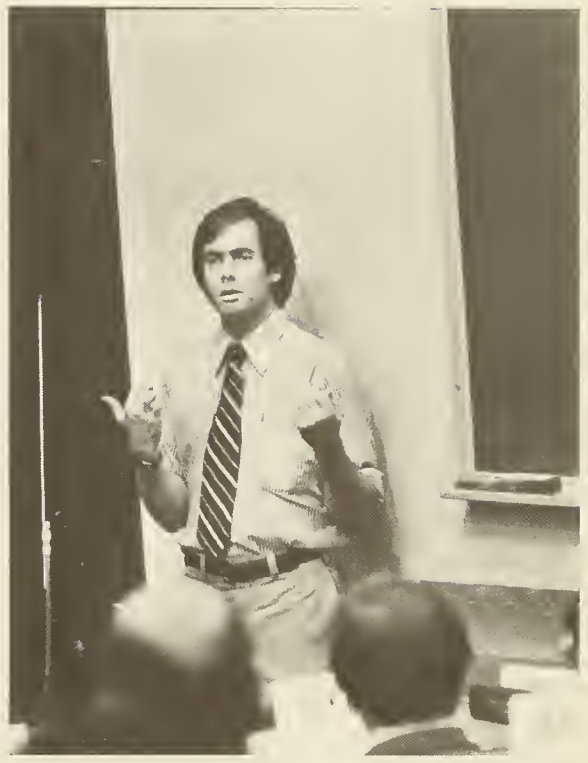
The Medical/Dental Track has been developed for physicians, dentists, medical and dental students. It offers the choice between a one-year program (M.P.H. with concentration in Health Policy and Management) and a two-year program (S.M. in Health Policy and Management). Both tracks include a core curriculum as well as courses designed specifically for physicians and dentists. Students choosing the one-year M.P.H. program must also fulfill the M.P.H. core requirements described on page 10, with minor substitutions. If core requirements for both the M.P.H. and the S.M. programs are fulfilled (the M.P.H. core must completed by the first year), the student may graduate in two years with both degrees.

Since the School offers a variety of courses in all areas of public health, a second-year curriculum can be carefully tailored to a student's particular interests and career objectives. Please refer to the detailed listings of Courses of Instruction in this Register.

These courses can be supplemented by offerings in other departments within the School, and in some instances, by courses in other schools within the University, such as the John F. Kennedy School of Government. A special inter-university relationship also allows students to enroll in courses at the Massachusetts Institute of Technology.

Applied Research

An applied research project during the second year is conducted under the supervision of a clinical preceptor from a local agency or institution and an academic advisor from the School's faculty. The experience is designed to allow students to further develop and refine those skills most appropriate to their chosen discipline. Clinical and academic members of the student's project team are carefully selected with this end in mind. An Applied Research Seminar allows students, clinical preceptors, and academic advisors to bring together a variety of perspectives in a structured classroom setting. Students prepare a research report based on their clinical experience and a review of pertinent literature.



Dr. Young, Director of the Graduate Program, uses the case study approach in his class.

Admission

The program seeks candidates whose academic record, personal characteristics and work experience suggest intellectual competence and outstanding potential in the areas of health policy and management. Enrollment is limited to fifty or fewer students per year in order to allow for maximum interaction between students and faculty both inside and outside the classroom. All applicants must demonstrate through course work and aptitude test performance the ability to master the quantitative and analytic content of the program. Academic backgrounds in either the natural or social sciences are equally acceptable. Applications from candidates who have at least one year of pertinent post-baccalaureate work experience in the health field are considered to be most competitive for admission. (Please see Requirements for Admission on p. 13.)

Deferred admissions are available for a limited number of applicants who demonstrate strong potential in the field but who have not had work-related exposure to the health care system. Students who receive deferred admissions status are expected to work within the health system, in a position approved by the Program, for a minimum of one year before matriculating. Applicants whose preparation appears deficient in some area, e.g. quantitative methods, may be offered provisional acceptance, contingent upon the successful completion of specific course work in advance of matriculation.

One of the goals of the School of Public Health is to address the health-related problems of the underserved, both in this country and abroad. Accordingly, the Program is particularly interested in receiving applica-

Some of the courses that the Department and the Division offer are listed below. The corresponding descriptions are on p. 101.

Economic Analysis; Health Economics; Economic Analysis for Public Health; Economics of Health Planning; Seminar on Economics for Health Policy Analysis; Quantitative Policy Analysis; Introduction to Operations Research; Decision Analysis and Evaluation; Clinical Decision Making; Administrative Systems; Administration of Health Services; Administration of Personal Health Services; Personnel and Labor Relations; Health Care Operations Management; The Management of Organizational Design and Change; Planning in the Hospital Setting; Financial Management in Health; Introduction to Management Information Systems; Health Care Issues and Institutions; Seminar in Health Planning and Regulation; Design and Implementation of Health Care Regulation; Policy Implementation; Human Rights in Health; Government and Private Funding for Research and Health Care Programs; Reimbursement Systems; Quality Assurance in Health Services; Health and Social Welfare Systems in Cross-National Perspective; The Health Maintenance Organization: Exploring an Alternate Care System; Issues in Mental Health Policy; Dental Public Health Practice; Dentistry and Social Policy; Applied Research Seminar; Tutorial Programs; and Field Work.

tions from individuals whose special concerns extend to people in inner cities, rural areas, developing countries, and other locations where such problems exist.

The Graduate Record Examination (GRE) is required for all applicants except physicians, dentists and medical or dental students applying for the Medical/Dental Track who may submit the Dental Aptitude Test (DAT) or the Medical College Admissions Test (MCAT). GRE scores more than five years old are considered to be invalid and the test must be retaken.

Career Outlook

The School has developed an effective job placement mechanism for its graduates, utilizing both faculty and alumni. Additionally, a network of contacts has been developed with potential employers throughout the country and with professionals in a wide variety of executive-level positions who have attended the School's Executive Programs in Health Policy and Management. Examples of positions secured by Program graduates include: director of a community hospital; administrative director of a primary care center; director of a certificate of need program; analyst in a state regulatory agency; planner in HEW; director of a state commission on the handicapped; analyst in the Congressional Budget Office; and economist/planner with a health maintenance organization.

Division of Health Services Administration

Introduction

The primary mission of the Division of Health Services Administration is to contribute to the development of a cadre of trained men and women who are capable of formulating a coherent definition of the health problems of a population, and a general theory of action for managing these problems. These capabilities require substantial knowledge of factors that enhance or threaten health status and analytic, managerial and interventional skills to plan, implement, manage and evaluate measures, policies or programs designed to promote and improve well-being and reduce morbidity, disability and premature death.

The program in Health Services Administration has been designed to meet the needs of: 1) health professionals and professionals from related fields who expect to devote a substantial portion of time to administration in a health setting; 2) health professionals and professionals from related fields who want to begin the process of preparing themselves for academic careers in areas related to the administration of health services, and who expect to proceed to a program of study at the doctoral level; 3) lawyers interested in health-related careers and areas such as medical ethics, patient's rights, regulation and planning; and 4) residents in General Preventive Medicine who are primarily interested in health services administration and who wish to have an additional year of study in an academic setting, beyond the one year required by the American Board of Preventive Medicine.

Degrees

Master of Public Health with a concentration in Health Services Administration; Master and Doctor of Science in Health Services Administration.

Curriculum

Programs of study are developed from the following courses:

1. *Health Services and Health Services Systems*
   HPM-HSA 264a,b. Health and Social Welfare Systems in Cross-National Perspectives; HPM-HSA 265d. Health Maintenance Organizations; ID 209a,b. Health Services in Developing Countries; EHI 201a, 201b. Principles of Environmental Health; MCHA 204c,d. Programs and Issues in Maternal and Child Health Services; HPM-HSA 275a,b. Dental Public Health Practice; MCHA 214a,b (HMS Geriatrics 702), The Elderly Person in the Health Care System.
2. *Analytical Techniques*
   BIO 101a,b. Principles of Biostatistics; BIO 207c,d. Survey Research Methods in Community Health; EPI 201a. Introduction to Epidemiology; HPM-BIO 216c. Analysis of Health and Medical Practice; HPM-HSA 205a,b. Economic Analysis for Public Health; BIO-HPM 215c,d. Health Program Evaluation.
3. *Management and Planning*
   HPM-HSA 221a,b. Administration of Health Services; HPM-HSA 222c,d. Administration of Personal Health Services Programs; HPM-HSA 236d. Planning in the Hospital Setting; HPM-HSA 243c. Seminar in Health Planning and Regulation; HPM 207c,d. Economics of Health Planning; HPM 220a,b, 220c,d. Administrative Systems; POP-HPM-HSA 263c,d. The Design and Management of Population Programs.
4. *Substantive Areas*
   HPM-HSA-MCHA 252a,b. Human Rights in Health; MCHA 211b. Health Care of Women; MCHA 208c,d. Rural Health Services; MCHA 203b. Content of Maternal and Child Health Services.

Admission

The program seeks candidates with professional degrees at the graduate level with some experience in management or in planning of health services. Health professionals with a terminal baccalaureate degree with substantial experience relevant to health services administration may be considered for admission.

Doctoral Program

Applicants with a master's degree in health services administration or equivalent may be accepted into the doctoral program. The doctoral program is designed to prepare health professionals for careers in teaching and research.

Courses in conjunction with other departments:

Statistical Methods for Health Policy and Management; Forecasting and Its Use in Health Programs and Institutions; Health Program Evaluation; Analysis of Health and Medical Practices; Human Rights in Health; Health Planning in Developing Countries; The Design and Management of Population Programs; Political Economy of Environmental Health Regulations; and Environmental Health Policy Analysis.

Dr. Valadian speaks to her seminar group.

Department of Maternal and Child Health and Aging

Isabelle Valadian, M.D., M.P.H., Professor of Maternal and Child Health and Head of the Department

Faculty

Professors Curran, Reed, and Yerby; Assistant Professors Deykin and Walker; Lecturers Dwyer, Hayes, Russell, and Wray

Teaching and Research Staff

Lecturers and Visiting Lecturers DeLollis, Gold, Hargreaves, Newberger, Ryan, and Stubblefield; Research Associates Berkey and Butler; Consultant Janeway

Introduction

The Department of Maternal and Child Health and Aging is concerned with the human life cycle factors which affect individuals' life-long health status and the interventions and services needed to promote health.

Degrees

Master and Doctor of Public Health with concentration in Maternal and Child Health and Aging; Master and Doctor of Science in Maternal and Child Health.

Programs

Goals/Curriculum

The major objective of the department is to provide in-depth understanding of the physical, social, and psychological determinants of health at various stages of the human life cycle and to promote practical application of this knowledge. Specifically, the curriculum emphasizes:

1. the developing individual and his or her changing physical, psychological, social, and cognitive strengths from conception to senescence within the context of family and community;
2. the examination of those health, welfare and related services which are currently available and those which could be instituted to meet the health needs of individuals, including those with chronic illness, handicapping or other special conditions;
3. the roles of governmental bodies, health agencies, voluntary and consumer groups in the organization and delivery of health and social services at all levels, e.g., international, national, state and local;
4. the interface of law with health and related systems which has varied implications for service and research at different stages of life.
5. the skills in policy formulation, planning, managing and evaluating of MCHA programs.

Research

The research of the Department involves a broad range of interests. The Longitudinal Studies of Child Health and Development started in 1930 have been expanded to investigate the patterns of growth, maturation and be-

havioral, social and nutritional changes in an aging cohort. The availability of repeated measures collected over many years on the same cohort has facilitated the study of variables influencing health status at various stages of life and in relating adult health to child health and development. Investigation of patterns of physical and behavioral development during childhood and adolescence have particular emphasis on the development of statistical methods for analyzing processes of growth and development, and the utilization of these methods in health program planning and evaluation.

The department's interest in growth patterns is further reflected by an on-going study of the physical development of vegetarian children.

The interface between heath and social well-being is a major concern of the department. Two studies are currently in progress which are designed to broaden our understanding of the utilization of health care. One study is a community-wide survey of the availability of child health services and their utilization in western Massachusetts. The other study is designed to ascertain the impact of a family advocacy service on the health and social functioning of families enrolled in a primary care health center.

Doctoral students' research activities represent a range of interests in the areas of health, development, and service delivery. The adolescent determinants of adult gynecologic health, the physical and psychological status of children with Downs Syndrome, the development of scoliosis, determinants of recidivism in child abuse and the evaluation of programs for pregnant adolescents form the basis of recently completed or in-progress doctoral studies.

Projected research endeavors by departmental faculty and students include a study of neurological and cognitive sequelae of early infancy apnea; an investigation of the effects of marital separation on school-aged children; an assessment of developmental intervention of high risk infants; and a survey of attitudes and careers of women physicians.

Admission

The curriculum prepares professionals with advanced degrees from health disciplines (including medicine, dentistry, nursing, social work, nutrition, psychology, health education) and other related areas such as law, education, and anthropology to assume responsibility for advocating, formulating policies, organizing and administering health care services for women, children, youth and the aged.

Students in the M.P.H. program who concentrate in MCHA are required to take 10 credits from courses in the department. Master of Science students are required to take 20 credits. Please see p. 9 for more specific degree requirements.

A limited number of fellowships may be available for master's candidates concentrating in the area of maternal and child health.

Career Outlook

The master's degree prepares candidates for positions where they will be instrumental in initiating and reshaping public health practice at federal, state, and local levels. In addition, the doctoral program trains researchers and prepares professionals for academic positions.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 105.

Child Growth and Development; Child Growth and Development II: Advanced Seminar; Child Growth and Development III: Factors Affecting Growth and Development; Primary Maternal and Child Health Care; Content of Maternal and Child Health Services; Programs and Issues in Maternal and Child Health Services; Research Approach to Growth, Development and Health of the Child; Maternal and Child Health in Developing Countries; Nutrition in Child Growth and Development; Rural Health Services; Social Services for Mothers and Children; An Introduction to Personality and Cognitive Development; Health Care of Women; Dental Health Services in Maternal and Child Health; The Elderly Person in the Health Care System; Tutorials; Field Study; and Research.

In conjunction with other departments:

Child Development and Social Policy and Human Rights in Health.

Department of Microbiology

M. E. Essex, D.V.M, Ph.D., Professor of Microbiology and Head of the Department

Faculty

Professors Cairns and Nichols; Associate Professors Cerny and Haseltine; Assistant Professors Eardley, Eisenstadt, and Grant; Lecturers Madoff and Modabber

Teaching and Research Staff

Visiting Lecturers Cotter, Fiumara, Gilfillan, Grady, Herrmann, MacDonald, Walsh, and Wright; Instructor M. Benfari; Research Associates Girard and Greenberger

Introduction

The Department of Microbiology is primarily involved with the biology, epidemiology, and immunology of infectious disease agents, especially viruses. Training programs leading to the Doctor of Science degree are emphasized but the Department also participates in the professional degree programs offered by the School, for those so interested. Doctoral training areas include basic and applied research in virology, immunology, cancer biology and medical microbiology.

A collegial atmosphere prevails among faculty and students, and students are encouraged to participate in the numerous seminar series and informal discussion groups the Harvard Medical Area has to offer. Coursework is available in several areas of microbiology, in biochemistry and cell biology at the Harvard Medical School, other schools within Harvard University, or at the Massachusetts Institute of Technology, in addition to the offerings of the Department and the School.

The Department also maintains a relationship with the Massachusetts State Laboratory Institute, and is involved in joint research efforts with some of our associates at that Institute. In addition to the above research programs, the Department is involved in the teaching of public health policy and planning, especially as it relates to infectious disease. A research degree program in this area is not currently available, but is being planned for the future.

Degree

Doctor of Science in Microbiology, with specialization in a particular area. There are no programs leading to the Master of Science in Microbiology as the terminal degree.

Research

Some of the areas in which Department faculty are conducting research are: cellular and tumor immunology, cancer biology and epidemiology; immunodiagnosis, immunochemistry and biochemistry of respiratory and enteric viruses, environmental aspects of virology, and mutagenesis.

Program

Goals

To provide training in research leading to a doctoral degree in microbiology, with specialization in a particular area.

"Case Studies in Public Health Planning and Decision Making" stimulate an active discussion between Dr. Nichols and a student.

Curriculum

At the doctoral level, major emphasis is placed on research training in immunology, virology, cancer biology, and medical microbiology. Students are encouraged to develop strengths in related areas such as molecular biology and epidemiology.

During the first two years students take courses as required to establish a firm background in the appropriate areas. By the second year at the latest, the student should be introduced to laboratory research, and should be formulating a thesis proposal for evaluation. Each student is expected to demonstrate a proficiency in laboratory techniques and an ability to reason through a research problem before undertaking doctoral research. These skills can be obtained by participation in laboratory courses and laboratory tutorials, as well as departmental and interdepartmental student and faculty seminars. Faculty research collaboration is underway with several laboratories outside the Department, and student participation in these programs is also encouraged.

Doctoral students should select a specific research topic in one of the areas mentioned under *Research* soon after admission to the program. (See p. 13 for specific degree requirements.)

Admission

Prospective students should have a strong background in biology and chemistry. Previous training in microbiology, virology, and/or immunology is desirable but not necessary. Students are admitted who have a baccalaureate degree as well as those with graduate degrees.

Career Outlook

Our recent graduates have accepted research and/or teaching positions with public and private academic institutions, with governmental agencies such as National Institutes of Health and the Center for Disease Control and occasionally with private industry.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 107.

Critiques of Current Literature on Infectious Diseases; Clinical Problems in Infectious Diseases; Laboratory and Immunologic Aspects of Infectious Diseases; Departmental Seminar; Environmental Carcinogenesis; Intracellular Microorganisms Pathogenic for Man; Case Studies in the Epidemiology of Infectious Disease; Sexually Transmitted Diseases; Virology; The Molecular Biology of Cancer; Tutorial Programs; and Research.

Department of Nutrition

Robert P. Geyer, S.B., S.M., Ph.D., Professor of Nutrition and Head of the Department

Faculty

Professors Bloch and Lown; Associate Professors Antoniades, Hayes, Herrera-Acena, and Thenen; Assistant Professors el Lozy, Mora, Verrier, and Witschi; Lecturers Austin and Huber

Emeriti

Professors Hegsted and Stare

Teaching and Research Staff

Visiting Lecturers Gershoff and Samonds; Lecturer Nicolosi; Research Associates Ausman, Chu, DeSilva, Gallina, Goldberger, Graboys, Lew, and Lynch; Consultants Cannon and McGandy; Assistants Bruno and Gallagher

Introduction

The Department of Nutrition provides training and research opportunities in the basic science and the applied areas of nutrition with orientation towards problems of contemporary public health importance, including cardiovascular disease, obesity, and diabetes. Other areas of nutrition concerning policy, planning, and applied interventions have been a long-standing interest of the Department, as have health problems related to nutrition in this country and in Central and South America, Africa, and Asia.

Degrees

Doctor of Science in Nutrition; Master and Doctor of Public Health with concentration in Nutrition; Joint Department Master of Science (with Health, Policy and Management); and Doctor of Science (with Epidemiology or Toxicology).

Research

The research of the Department involves various aspects of nutrition ranging from cell biology and metabolism to animal pathophysiology, clinical studies, and policy planning at domestic or international levels. At the molecular level are studies on the regulation of cell growth by hormonal growth factors obtained from human blood components and the synthesis and application of perfluorocarbons for blood replacement. Mechanisms of nutritional interactions with experimental obesity and effects of diet on lipoprotein metabolism, atherogenesis and diabetes are examples of nutritional biochemistry and pathophysiology studies in progress.

Extensive use is made of computers both in the mathematical modeling of growth and in interactive dietary analysis and counseling. Other areas of applied research include evaluation of nutrition programs and dietary methodology.

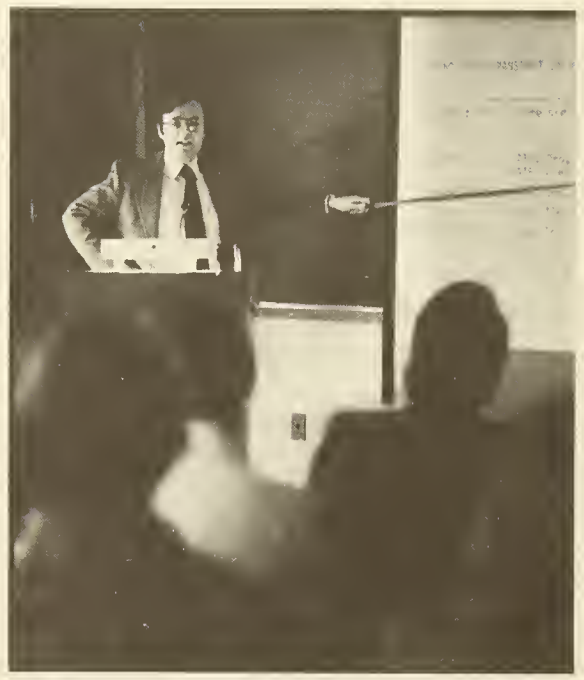
At the international level are projects concerning the effects of malnutrition on mortality, morbidity and mental and physical development, and the development of a methodology for assessing the impact of food price policy on protein-calorie intake by various income classes. Research activities of the faculty are listed under the course number "NUT 350-365."

Programs

Goals

For students choosing to combine the study of health policy and management with nutrition, the Department through the joint terminal Master of Science in Nutrition and Health Policy and Management degree program helps students learn to deal effectively with the many nutrition-related problems that are arising on both local and national levels.

The Doctor of Science in Nutrition degree program is designed to train highly qualified individuals interested in laboratory-oriented approaches to solving nutrition and metabolic problems. By utilizing a number of scientific disciplines and engaging in appropriate research, students learn and use the latest techniques in biochemistry, physiology, and related fields. The research, whether basic or applied, is relevant to human health. The joint Doctor of Science degree in the Departments of Nutrition and Epidemiology furnishes thorough training in both of these disciplines, enabling graduates to apply sound epidemiological methods to an ever increasing number of important nutritional problems. Applicants interested in earning the Doctor of Public Health degree in an area dealing with nutrition should contact the department for information. A program combining nutrition and toxicology is now being planned. Interested persons should communicate directly with the Head of the Department of Nutrition.



Dr. Albert Owen discusses "The Regulation of Amino Acid Uptake into Human Diploid Fibroblasts" at a seminar in April.

Curriculum

Students in the M.P.H. program who concentrate in Nutrition are required to take Principles of Nutrition (NUT 201a,b), Departmental Seminars (NUT 204a,b,c,d) and at least one other course offered by the Department.

Students in the terminal S.M. program must complete the degree requirements in both the Nutrition and the Health Policy and Management programs. The required courses for the Nutrition component of this joint degree are Principles of Nutrition (NUT 201a,b), Nutrition Policy Formation and Program Operation (NUT 203c,d), Departmental Seminars (NUT 204a,b,c,d), Biochemistry and Physiology of Nutrition (NUT 205c,d), and a course in biochemistry. (Please see p. 13 for specific degree requirements.)

For the S.D. in Nutrition degree, students are required to take graduate level courses in biochemistry, physiology, epidemiology, and biostatistics in addition to the following Nutrition courses: Principles of Nutrition (NUT 201a,b), Nutrition Policy Formation and Program Operation (NUT 203c,d), Departmental Seminars (NUT 204a,b,c,d), Biochemistry and Physiology of Nutrition (NUT 205c,d), and Laboratory and Animal Research Techniques (NUT 206c,d). Electives pertinent to the student's interests and the doctoral program's requirements are also taken. Tutorial research is begun during the first year, and a thesis must be completed within the period prescribed by the School (see p. 17).

The requirements for the Dr.P.H. degree are the same as those given for the S.D. in Nutrition degree, but the candidate must hold a M.P.H. degree.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 109.

Principles of Nutrition; Nutrition Policy Formation and Program Operation; Departmental Seminars; Biochemistry and Physiology of Nutrition; Laboratory and Animal Research Techniques; Nutritional Aspects of Human Disease; Food Science and Nutrition; Nutrition Problems of Less Developed Countries; Tutorial Programs; and Research.

In conjunction with other departments:

Nutrition in Child Growth and Development, and Nutritional Epidemiology.

The joint S.D. degree in Nutrition and in Epidemiology requires the student to take the courses designated for the Doctor of Science programs in the respective departments. In addition to these courses, a minor field must also be selected that satisfies both departments. A satisfactory thesis dealing with nutrition and epidemiology must be submitted within the time limit set by the School.

Admission

Admission to the terminal S.M. degree program is the joint responsibility of the Departments of Nutrition and Health Policy and Management. Acceptable candidates must have a distinguished bachelor's degree with significant biological background. This joint master's degree requires two full years of study.

The laboratory-oriented S.D. in Nutrition degree program may be entered at either the master's or the doctoral level. It is highly recommended that the latter route be selected even by students with only a bachelor's degree. The Department may in certain instances exercise its own determination as to which option should apply. An excellent background in chemistry, biology, nutrition, or some other relevant science discipline is necessary for admission. Admission for the joint nutrition and epidemiology S.D. degree requires a strong background in biology and mathematics. Approval by both the Departments of Nutrition and Epidemiology is necessary. Applicants interested in this program should contact the Head of the Department of Nutrition before formally applying. Applicants for the Doctor of Public Health degree with emphasis in nutrition should communicate with the Department Head prior to filing an application.

Career Outlook

Some positions recent graduates have taken: food aid administrator in Gambia; local health clinic administrator; director of nutrition support service in a medical center; assistant professor of nutrition at a school of medicine; nutritionist for federal nutrition evaluation agency; nutrition educator for national Tunisian institute; community nutritionist for state health project; food analytical chemist for industrial firm; postdoctoral research fellows in medical centers and universities; nutritionist at a school of public health; and assistant professor of biochemistry at a university.

Department of Physiology

John B. Little, A.B., M.D., Professor of Radiobiology and Acting Head of the Department

Faculty

Professors Brain, Ferris, Hornig, Little, Mead, Peters, Whittenberger and Tashjian; Associate Professors Amdur, D. E. Leith, Sorokin, Speizer, and Wegman; Assistant and Visiting Assistant Professors Baker, Boden, Butler, Drazen, Eisenstadt, H. Feldman, Gehr, Greenlee, Kennedy, Keyserling, Reynolds, Rice, Richardson, Schonbrunn, Smith, Toscano, and Valberg; Lecturers Murphy, Ofner, and Snook

Teaching and Research Staff

Lecturers Douglass, R. Feldman, Levy, and Storm; Research Associates Aebersold, Banzett, Castile, Henson, Loring, Nagasawa, Robertson, Voelkel, and Zamansky; Visiting Lecturer Oliver; Consultant McGandy; Assistant Vetrovs

Introduction

The Department of Physiology has research and teaching activities which include physiology as a basic medical science, but which extend beyond pure physiology to encompass a broad spectrum of environmental and occupational health problems. The mechanisms of action and the adverse health effects of chemical and physical factors in occupational and community settings are typical problems that have been central to the Department's interests. Such research provides the basis for prevention and control; the problems are very complex and require the insights of many specialties. The faculty and staff of the Department reflect the multidisciplinary nature of the field and include physicians, physiologists, physicists, engineers, toxicologists, and specialists in radiobiology and occupational health. Students and research fellows come with similarly varied backgrounds.

Major objectives of the Department are to provide students with basic information on human physiology and on the relationship of human beings to their physical and chemical environment. These concepts in biology and health are examined in detail in such courses as Human Physiology, Principles of Toxicology, Radiation Biology, and Basic Problems in Occupational Health and Industrial Environments. Specific research projects of members of the Department offer students an opportunity to gain experience in research and to develop a capacity for critical evaluation of research methods.

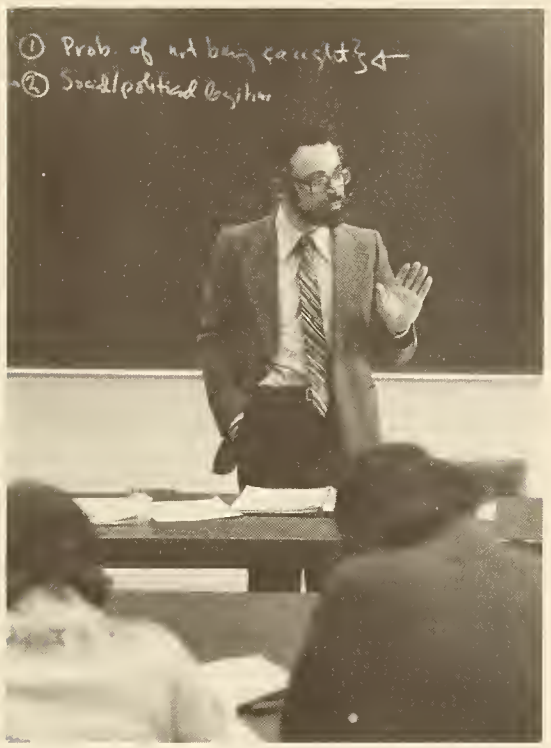
Information concerning programs and degrees in Occupational Medicine may be found on p. 57 under *Kresge Center for Environmental Health*.

Degrees

Master and Doctor of Science in Physiology; and Master and Doctor of Public Health.

Research

The research programs include topics such as: cellular effects of ionizing radiation, mechanisms of carcinogenesis and mutagenesis, inhalation toxicology, comparative respiratory physiology, the deposition and clearance



"Policy Issues in Occupational Health" is discussed by Dr. Boden.

of particles in the respiratory tract, and epidemiologic studies of working populations and community populations exposed to various toxic materials. Other research areas are the mechanical properties of lungs and chest wall, development of pulmonary function tests and testing equipment, and application of these methods to the study of respiratory disease in occupational and community environments. The research and training programs in toxicology include the development and use of differentiated animal and human cell strains which perform organ-specific functions in culture as models for studies on the biochemical mechanisms of toxicant uptake and action as well as for the development of preventive or reparative interventions. Other research areas in toxicology include enzyme reaction mechanisms, mechanisms of tumor promotion, development of new analytic methodology, and behavioral toxicology.

Programs

Pulmonary Biology

Goals

This program offers doctoral training in preparation for research careers in pulmonary biology. It is built on a public health viewpoint of the lung as a portal of entry and a target organ for environmental agents, and focuses on two aspects of organ system physiology: respiratory mechanics and respiratory defense mechanisms. Also emphasized are inhalation toxicology and the pathology of environmental and occupational lung disease. The biology is broadly based, ranging from molecular and cell biology to integrated organismic, environmental, and comparative physiology; both normal and pathological physiology are included.

Curriculum

Intensive course work in the first two years may include physiology, biochemistry, histology, engineering, toxicology, radiation biology, statistics, epidemiology, pathology, and immunology. The latter part of the program consists of research under the guidance of a faculty advisor. Collaborative research opportunities exist in several area institutions. (See p. 9 for specific degree requirements.)

Admission

Intended primarily for students with prior degrees in the physical sciences, or biology with a strong physical science and mathematical component. Two years of residence at the School are generally required to earn the S.M. degree; students with prior master's degrees in related areas may earn the S.M. degree in one year. Terminal master's degree programs are not ordinarily offered; students are expected to continue for the doctoral degree.

Career Outlook

Recent graduates and postdoctoral fellows have taken positions in academic, clinical, and government institutions doing basic and applied research and teaching in respiratory physiology and pathophysiology.

Radiobiology

Goals

This program is designed to offer doctoral level training in the cellular and molecular effects of radiation in preparation for research careers in radiation biology and experimental carcinogenesis.

Curriculum

Course work during the first two years emphasizes biochemistry, cellular and molecular biology, virology and genetics, as well as the preparation needed to develop the basic skills in laboratory techniques and data handling necessary for undertaking original research. The latter part of the program involves intensive laboratory research under the guidance of a faculty advisor. Some areas of ongoing research in the program include the study of: the induction of mutations and malignant transformation in mammalian cells by low and high LET radiations and by chemical agents; radiation-induced DNA damage and repair processes at the cellular and molecular levels; cytogenetic effects of radiation and chemical pollutants; and the effects of radiation in human diploid cells from cancer-prone patients. (See p. 9 for specific degree requirements.)

Admission

Admission requirements include an appropriate background in biology, chemistry or physics. Although students are usually admitted into the master's program, they are expected to continue for the doctoral degree. A terminal master's program as such is not usually offered. Some students with prior master's or professional degrees, or with an unusually strong background in biology, may be admitted directly into the doctoral program.

Career Outlook

Recent graduates of the program have primarily entered academic careers as university-based independent research scientists. Several graduates have entered governmental service in the Department of Energy or the Environmental Protection Agency.

Toxicology

Goals

The research and training program in toxicology provides students with knowledge of the health implications of environmental chemicals, their interactions with a variety of cellular systems, biochemical mechanisms of cellular toxicity, the means to identify toxic environmental chemicals and to prevent or reverse adverse effects where possible.

Curriculum

The predoctoral program in toxicology is related directly to the doctoral training program of the Department of Pharmacology, a part of the Division of Medical Sciences at Harvard Medical School.

The first year is usually devoted to course work. Courses are taken within the Division, at the School of Public Health, at Harvard University in

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 110.

Human Physiology; Principles of Toxicology; Pulmonary Cell Biology; Radiation Biology; Seminar in Toxicology; Advanced Toxicology; Environmental Carcinogenesis; Evaluation of Occupational Health Problems; Structure and Function of the Mammalian Respiratory System; Tutorial Programs; and Research.

Cambridge or at M.I.T. Students are expected to pass qualifying examinations before the end of the third semester. Thesis research to qualify for the Ph.D. degree should be completed in a total of four to five years in residence.

Admission

Students are admitted as candidates for the doctoral degree only.

Students should have knowledge of organic, physical, and biological chemistry, general biology, physics and calculus. Deficiencies might be made up in the summer before entering the program. There is no language requirement. A personal interview is strongly encouraged.

Information regarding the graduate program in toxicology may be obtained by writing Professor Armen H. Tashjian, Jr., Laboratory of Toxicology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115.

Career Outlook

Upon receipt of the doctoral degree, it is expected that most students will take a period of postdoctoral fellowship training prior to entering a career in research in an academic institution, in government or industry.

Department of Population Sciences

Faculty
Professors and Visiting Professors Alonso, Dyck, Keyfitz, Levins, Lewontin, and Salhanick; Associate Professors W. Berggren, Masnick, and Repetto; Assistant Professors G. Berggren and Ewbank; Lecturers Frisch, Wray and Wyon

Teaching and Research Staff
Lecturers and Visiting Lecturers Guerrero, Kline, D. Korten, F. Korten, McIntosh, Morehead, Plank, and Strauss; Research Associates Holtrop, Seeley, and Whipple; Consultants Gamble, Goldstein, and C. Thomas

Introduction
Acting under the conviction that rapid population growth was thwarting efforts to provide better housing, education, nutrition, health services, and medical care, and that the disparity between rates of population increase and rates of development of human and economic resources is a crucial problem confronting society, the School of Public Health established the Department of Demography and Human Ecology in 1962 (renamed the Department of Population Sciences in 1969) and the Center for Population Studies in 1964. As the view of the role of population change in health and welfare has matured, increasing attention has been given to questions of the broader interrelations between population structure, health and welfare, and social change.

Degrees
Master and Doctor of Public Health with concentration in Population Sciences; and Master and Doctor of Science in Population Sciences.

Research
Some research activities of the Department are: working toward a better understanding of the biochemical and endocrinologic mechanisms controlling ovulation; studying the long-term impact of demographic changes within the United States; examining the interactions of fertility, income distribution and other aspects of socio-economic development; pursuing research applied to aspects of family planning and the interactions of fertility, nutrition and infectious diseases; continuing studies leading to community diagnosis of causes of rates of birth, death and migrations; studying biological aspects of population programs; studies of ethical aspects of population policies and programs; analyzing voluminous data collected in field studies in Haiti, including studies of mortality, morbidity, nutrition status, fertility and impact of programs; and examining factors that might improve food production.

Dr. Paul Kwong presents statistics on China in his lecture to his class.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 112.

Introduction to Population Sciences; Introductory Seminar on Population Sciences; Student Project Design Seminar; Basic Demographic Methods; Biological Basis for Fertility Control; Population Analysis in Developing Countries; Essentials of Human Reproduction; Population Analysis in the United States; Applied Mathematical Demography; The Spatial Aspects of Societies; Foundations of Agricultural Sciences; Population Biology; An Economic Approach to Population Policy; The Biological Determinants of Fecundity, Environmental Factors, and Population Growth; Comparative Analysis of Public Policies in Developing Countries; Introduction to Community Diagnosis of Birth and Death Rates in Developing Countries; Human Ecology; Demographic Variables in Environmental Policy; Applied Mathematical Demography Seminar; Formal Models of Movement; The Design and Management of Population Programs; Tutorial Programs; Field Studies; and Research.

In conjunction with other departments:

The American Household in Demographic Perspective and Health Planning in Developing Countries.

Programs

Goals

There is wide variability among the programs of individual candidates, reflecting the diversity of the students' background, national origins, previous education, areas of professional concern, and career goals. Given these varied curriculum needs, the overall goals of the program are to develop sophistication in data and information management and evaluation, as well as to provide a broad philosophical perspective on problems and issues in the population field and on related issues of health and health care.

Curriculum

Faculty affiliated with the Department are specialists in demography, ethics, epidemiology, economics, sociology, ecology, genetics, business, psychology, and medicine. The formal courses and the tutorial instruction of the Department are planned to prepare students for effective participation in population programs as administrators, research workers, or educators. Programs of study are offered in these areas: population, health, and nutrition; the design, management, and evaluation of population programs; the analysis of complex ecological systems; demographic analyses; and reproductive biomedicine. Although the Department offers a very flexible program, approximately half of the S.M. students are from or are primarily interested in health and population problems of underdeveloped countries. (Please refer to p. 9 for specific degree requirements.)

Admission

Students with bachelor's degrees in biological and/or social sciences, or in other population-related fields, are generally expected to spend two years in residence toward the S.M. degree. Students with prior master's or higher degrees, or extensive work experience, generally complete study toward the S.M. degree in one year. Approximately one-fourth of those who complete the S.M. degree enter the doctoral program.

Career Outlook

Some positions recent graduates have taken: director of a university center for population studies; principal statistician; executive secretary of an international committee on applied research in population; president of a medical services consultants group; medical director of a planned parenthood association; director of a medical clinic; a programme officer for U.N. Fund for Population Activities; a UNFPA coordinator; a population intern for USAID; and an associate programme officer in Health and Nutrition for UNICEF.

Department of Sanitary Engineering

Faculty

Harold A. Thomas, Jr., S.B., S.M., S.D., Gordon McKay Professor of Civil and Sanitary Engineering; J. Carrell Morris, S.B., A.M., Ph.D., A.M. (hon.), Gordon McKay Professor of Sanitary Engineering; Joseph J. Harrington, B.C.E., A.M., Ph.D., Professor of Environmental Health Engineering in the Faculty of Public Health and Gordon McKay Professor of Environmental Engineering in the Faculty of Arts and Sciences

Introduction

Members of the Department participate in the School of Public Health through teaching interdepartmental courses such as *Principles of Environmental Health* and *Environmental Health Evaluation and Management*. The courses listed are offered in the Division of Applied Sciences of the Graduate School of Arts and Sciences. Graduates of engineering colleges or scientific schools may be admitted to the Division as candidates for degrees in the Graduate School of Arts and Sciences. They may elect appropriate courses in the School of Public Health as part of the program for these degrees.

Further information can be obtained by writing to the Committee on Admissions, Graduate School of Arts and Sciences, Holyoke Center, 75 Mt. Auburn Street, Cambridge, Massachusetts 02138.

Degrees

Graduate School of Arts and Sciences: Master of Science; Master of Engineering; and Doctor of Philosophy.

Research

Department members and other faculty from the Division of Applied Sciences are studying a variety of environmental problems:

Oil pollution in the Sargasso Sea; sources, occurrence and fate of toxic organic substances in natural waters.

Microbiological control of schistosomiasis; biological control of marine fouling.

Robust statistical estimation of frequencies of large floods and severe droughts; computer and systems models in fluid management of severely burned patients at Peter Bent Brigham Hospital.

Large-scale agricultural planning models in Pakistan and India; avoidance of waste production in Brazil and other developing countries by choosing alternative flowsheets.

Some of the courses offered by the Division of Applied Sciences are listed below. The corresponding descriptions are on p. 115.

Chemistry of the Aqueous Environment; Hydrologic Cycles; Introduction to Environmental Microbiology; and Introduction to Environmental Engineering.

Design of Water Resource Systems; Seminar: Technology Choice in Water Resources Development; Stochastic Processes in Environmental Engineering; Seminar: Models for Environmental Systems Planning; Engineering Systems for Environmental Control; Water Quality and Its Management; Water Pollution Microbiology; Chemical Models of Natural and Polluted Waters; and Treatment of Water Supplies and Wastewaters.

Department of Tropical Public Health

Thomas H. Weller, A.B., S.M., M.D., LL.D., Richard Pearson Strong Professor of Tropical Public Health and Head of the Department

Faculty

Professors Chernin and Pan; Associate Professors W. Berggren, Michelson, and Spielman; Assistant Professors Boyer and Hoff; Lecturers Cash, Coolidge, and Daggy

Teaching and Research Staff

Lecturers and Visiting Lecturers Dammin, Fendall, Foege, Hopkins, Kaiser, Mata, Moschella, Most, Mott, Neva, Popenoe, Scrimshaw, Sencer, and von Lichtenberg; Research Associates Cicconi and Maguire; Assistant Wheeldon

Introduction

The health problems of the tropical regions, as in all poorly sanitated areas, are predominantly of an infectious and nutritional nature. The infectious diseases are the primary concern of the Department of Tropical Public Health, with emphasis given to protozoal, helminthic, and viral entities and to relevant arthropod and molluscan intermediate hosts. Within the framework of the Center for the Prevention of Infectious Diseases, the Department of Tropical Public Health shares with the Department of Microbiology the responsibility for an integrated presentation of information on important infectious agents.

The basic course, Tropical Public Health 201a, is designed to provide students in the Master of Public Health program with knowledge regarding major parasitic diseases, and with factual information concerning the epidemiology and control of selected entities of public health importance.

The resolution of the health problems of tropical areas requires a multidisciplinary approach involving a considered appraisal of human resources as well as of relevant social, economic, and political factors. Thus, the student concentrating in the Department in preparation for a career in the field of international health should, in addition to departmental courses, acquire a broadened experience by elective work in other areas.

Degrees

Master and Doctor of Public Health with concentration in Tropical Public Health; and Master and Doctor of Science in Tropical Public Health.

Research

The investigative program in the Department currently deals with pathogens ranging from viruses to helminths. Studies on the *in vitro* cultivation and the physiology and immunology of a wide variety of agents are in progress. Biological investigations on the molluscan vectors of the schistosomes comprise another area of major interest. Facilities are available for the training of a limited number of students at the Doctor of Public Health or Doctor of Science level. The doctoral degree applicant should, if possible, obtain the necessary medical science background prior to enrollment. Collaborative arrangements established with institutions in the tropics provide diversified opportunities for study and research overseas.

Programs

Tropical Public Health

Goals

The program has the following goals: (1) to provide students who have adequate training in the health sciences with the additional background essential for careers in research or service in developing countries; (2) to introduce students to the significance, recognition, and prevention of the major infectious disease problems of developing countries; and (3) to introduce them to the factors influencing human ecology and social development in such areas.

Curriculum

Students are required to fulfill the distribution requirements for an M.P.H. program (see p. 9) and to take specific specialized courses offered by the Department; the nature of the specialized course work will depend on the interest of the candidate.

Admission

The one-year M.P.H. degree program is designed for persons with prior medical degrees (M.D., D.V.M., D.M.D., D.D.S.) or doctoral degrees in biomedical science who are interested in problems of infectious disease in developing countries.

Career Outlook

Graduates customarily direct programs dealing with the control of tropical diseases or with research on these entities. Posts are in the public or private sector and at the national and international level. A separate career opportunity involves academic work in the area of preventive and social medicine with emphasis on the problems of the developing areas of the world.

Medical and Public Health Parasitology

Goals

The goals of the program are: (1) to acquaint the student with recent advances in the area of parasitic diseases and with the present status of such diseases throughout the world; (2) to develop skills for evaluation of the current literature and of control programs; and (3) to provide adequate background for conducting research on these diseases, including their biochemical and immunological aspects. The master's program is regarded as preparation for doctoral study.

Curriculum

All students must satisfy basic course requirements in biostatistics, epidemiology, and tropical public health. Students usually take advanced coursework in one or more of those disciplines, and also elect courses in health services, environmental health sciences, microbiology, and population sciences, etc., according to their interests. Students commonly cross-register for courses in the Harvard Medical School (e.g., immunology, pathology), the Harvard Graduate School of Arts and Sciences, and at M.I.T. Some of the elective work within the Department of Tropical Public

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 116.

Ecology, Epidemiology, and Control of Important Parasitic and Viral Diseases of Developing Countries; Perspectives in Tropical Health: The Background for Decision Analysis; Techniques for Investigation of Parasitic Infections; Clinical and Pathologic Features of Tropical Diseases; Principles of Vector Biology; Epidemiology and Control of Schistosomiasis; Current Problems in Malariology; Introduction to the Immunology of Parasitic Diseases; Tutorial Programs; and Research.

Health may take the form of tutorials, laboratory research projects, or both. (See p. 13 for specific degree requirements.)

Admission

Students with prior M.D. degrees or doctoral or master's degrees in biological or medical sciences are eligible for admission to this program. The exceptional candidate with a strong biological background but lacking a master's degree will be considered. For the student without prior preparation in pathology, biochemistry, and immunology, two years of course work are customarily required before the S.M. degree is awarded; students with sufficient prior preparation may earn the master's degree in one year. The majority of students go on to earn the S.D. degree and enter careers in research and teaching in the area of medical parasitology.

Career Outlook

Graduates are prepared to pursue academic or administrative careers that deal with the important parasitic diseases of man.

Ecology and Control of Vectors of Disease

Goals

The specific educational goals of the program are: (1) to acquaint the student with the various arthropod and molluscan vectors of disease and to develop an appreciation of the biology of these organisms and the means for their control; (2) to prepare the student to plan and evaluate control programs; and (3) to develop skills with respect to identification, maintenance, and experimental procedures involving these organisms.

Curriculum

In addition to required courses in epidemiology and biostatistics, participants in the program will take courses in vector biology, entomology, malacology, parasitology and microbiology. Depending upon the particular interests of each student, courses in cell biology, invertebrate physiology, pathology, genetics, population ecology and computer sciences may be required. Each participant will conduct a program of original research. (See p. 13 for specific degree requirements.)

Admission

Students admitted to this program normally have prior medical degrees or doctorates or master's degrees in biological or medical sciences. Most students take two years to earn the S.M. degree, although some students with previous education in relevant areas may earn the degree in one year. Almost all recipients of the master's degree continue on for the doctorate, in preparation for careers in teaching and research.

Career Outlook

The primary goal of this program is to train vector biologists for careers in teaching and research in universities and in governmental and international agencies. Graduates are expected to occupy key positions in programs directed toward investigation and controlling vector-borne disease. International health is emphasized. Thus, graduates of the program may engage in basic biological studies and in operational research.

Centers, Offices, and Special Programs

Center for the Analysis of Health Practices

Efforts to promote equity of access or to improve the quality of health care have often had unexpected, and occasionally adverse, effects on the economy, legal institutions, and even on the efficacy and effectiveness of medical care itself. These complex and poorly understood ramifications of choices in the field of health suggest that decisions ought no longer to be considered the province of any single discipline, and that the study of many problems ought not to be left to the chance association of appropriate experts.

The Center for the Analysis of Health Practices (CAHP) represents one of Harvard University's responses to these needs. Based in the School of Public Health, CAHP provides a focus for the research activities of members drawn from the Faculties of Medicine, Government, Law, and Arts and Sciences, and the Departments of Health Policy and Management and Biostatistics of the School of Public Health. Members of the Center include some 25 physicians, economists, policy analysts, statisticians, sociologists, engineers, and systems analysts who are engaged in collaborative research dealing with the application of new technology to health care, medical economics, and the evaluation of medical interventions and primary care. In each of these subject areas, the investigative approach is directed at issues of efficacy, cost-effectiveness and public policy. In order to carry out its research agenda, CAHP has established collaborative relationships with most of the major teaching hospitals affiliated with Harvard Medical School, other providers of health care, insurance companies, and agencies of local, state and federal governments.

The research output of the Center appears in books, monographs, serial publications, discussion papers and, for a more general audience, in a quarterly *Newsletter* distributed to more than 5,000 individuals in government, business, insurance companies, state medical and hospital associations, medical schools and universities, and provider institutions.

The Center offers a variety of means for students to participate in the conduct of its research. One such opportunity is provided by the *Seminar Program in Health and Medicine*, jointly sponsored by the Department of Biostatistics and CAHP. The Seminar consists of small working groups, each made up of interested individuals from within as well as outside the University, which spend one or more years working on particular problems in the health sector. The entire membership of the Seminar meets biweekly for dinner at the School of Public Health, following which the component working groups spend the evening addressing their areas of research interest.

In addition, students whose dissertations concern issues in the health sector may wish to use the Center as a resource during the development of their theses. Alternatively, a limited number of students may find opportunities to participate in Center-sponsored research projects during the period of their enrollment in the University.

Students and faculty members who do not have a formal relationship to the Center may remain aware of the research activities of its members by attending the weekly "brown bag" workshops which serve as the major vehicle for communication among the members of the Center and their collaborators. These working seminars provide an opportunity for the discussion of potential projects, methodologic problems, or projects in progress.

Inquiries about programs or activities of the Center should be directed to its staff. The Director is Howard S. Frazier, M.D.; Associate Directors are Peter Braun, M.D., Herbert Sherman, D.E.E., and Eleanor Druckman, M.S.

Center for Population Studies

The Center for Population Studies was established in 1964 under the leadership of the School of Public Health, as a university-wide Center to join scholars and scientists in different fields in a common approach to human population problems. The members and research associates of the Center are drawn from the Departments of Biology, Economics, Government, and Sociology; the Division of Applied Sciences; and the Schools of Public Health, Design, Education, Medicine, and Divinity. The Center is located at 9 Bow Street, Cambridge.

In the School of Public Health, the Department of Population Sciences welcomes qualified candidates for the various degrees offered by the School. Courses open to all qualified students are also given by members of the Center in the Department of General Education and in the other parts of the University listed above.

The present research programs of the Center and the Department focus on several themes: laboratory and clinical research programs in human reproductive biology; economic, social, and environmental determinants and consequences of population change in America and other developed and developing countries, including public health aspects of fertility and the balance between populations and their resources; problems of urbanization and internal migration in both developed and developing countries; theories of population kinematics and dynamics and their implications for public policy; political and ethical aspects of population policy; historical population studies; population education; and adolescent growth and menarche.

Center for the Prevention of Infectious Diseases

The Center for the Prevention of Infectious Diseases comprises the Departments of Microbiology and Tropical Public Health. Working in close collaboration, the staffs of the two Departments are concerned with the broad spectrum of agents that parasitize man and with their relevant arthropod and molluscan vectors.

On a global basis the infectious diseases remain a primary cause of mortality. In the developed areas of the world, morbidity attributable to infectious diseases persists as a major impediment to the enjoyment of health. An increasing number of chronic degenerative diseases are recognized as stemming from the insults of prior infectious processes. In many societies, acceptance of the concept of population control awaits containment of undue mortality induced by the infectious diseases and the consequent assurance that children who are born will have a reasonable prospect of achieving maturity. Considerations such as the foregoing emphasize the continuing need for the public health expert to possess knowledge of the rapidly changing technology of the control of infectious diseases, as well as basic knowledge concerning the attributes and epidemiologic characteristics of the responsible agents.

The faculty of the Center for the Prevention of Infectious Diseases work together to discharge a common responsibility for multidisciplinary instruction in the various facets of diseases of infectious etiology. The formal course offerings of the two Departments are designed and scheduled to permit the acquisition of a broad basic knowledge of infectious diseases as well as an introduction to specialized subject areas. For qualified advanced students, concentration in specific areas with participation in collaborative or individual research is encouraged at both predoctoral and postdoctoral levels. The wide variety of current research projects in the Center permits acquisition of experience both at home and abroad, in the laboratory or in the field.

The Director of the Center is Thomas H. Weller, M.D.; the Associate Director is Roger L. Nichols, M.D.

The Kresge Center for Environmental Health

This Center includes the Departments of Physiology, Sanitary Engineering, and Environmental Health Sciences and serves as a focus for environmental health and occupational health activities within the School of Public Health. Full-time faculty within the Center are physicians, engineers, physiologists, mathematicians, toxicologists, chemists, physicists, and other professionals. This diversity enables the staff to deal effectively with environmental and occupational health problems which require a multidisciplinary approach.

Specific categories in which the Center conducts research and training include:

1. Occupational health
2. Air pollution effects and control
3. Environmental toxicology
4. Radiation biology
5. Medical radiological physics
6. Radiological health (radiation protection)
7. Respiratory physiology
8. Environmental health engineering
9. Environmental health management

Degree programs include the Master of Public Health, Master of Science, Master of Occupational Health, Doctor of Science, and Doctor of Public Health. Formal requirements for each of these degrees are outlined in other sections of the catalog. Students interested in any of the above areas ordinarily enroll in the School of Public Health. Students whose primary interest is in problems of water quality and water resources generally enroll in the Division of Applied Sciences of the Graduate School of Arts and Sciences.

The Director of the Kresge Center is James L. Whittenberger, M.D. The Associate Director is Dade W. Moeller, Ph.D.

Educational Resource Center for Occupational Safety and Health

The overall objective of the Educational Resource Center is to train professionals who will be involved in preventing occupational disease and injury. Employment opportunities exist in universities, governmental agencies, industry, and labor. The educational programs mentioned here are currently supported by a grant from the National Institute of Occupational Safety and Health. This grant provides tuition and stipend support for qualified individuals. For further information about any aspects of the four educational programs listed below, contact the Director of the Occupational Health Program. Formal requirements for the degrees are on pp. 9-17.

Occupational Medicine

Training in occupational medicine at the Harvard School of Public Health consists of two years of training in the public health disciplines relevant to the prevention and control of occupational disease and injury. The first year is primarily didactic and can lead to the Master of Science or Master of Occupational Health degrees. The basic course requirements are listed under the Master of Occupational Health degree. The second residency year consists of applying the skills learned during the first year to problem solving and research. Health hazard evaluations are conducted with faculty supervision, residents are encouraged to become involved in research projects, and other training activities relevant to the resident's interest can

be arranged in industry, government or labor unions. Upon completion of this two-year program, physicians are eligible for certification by the American Board of Preventive Medicine (Occupational Medicine).

Industrial Hygiene and Safety
The two-year master's program in industrial hygiene and safety is designed to help meet the demand for professional personnel with the skills and scientific knowledge needed to identify and control health problems that exist in the workplace. The curriculum generally includes recommended and required courses dealing with basic problems in occupational health and industrial environments, environmental control, identification and measurement of air contaminants, air and gas cleaning, principles of toxicology, and aerosol technology.

Candidates for the program normally have a baccalaureate degree in engineering, chemistry, physics, or biology. Those with master's degrees in the above disciplines or prior training or experience in related areas may be able to earn the S.M. degree in one year.

Occupational Safety and Health
A small number of individuals with a baccalaureate degree and with advanced training in social or natural sciences may gain admission to a S.M. degree program in occupational safety and health. The program can emphasize either the epidemiologic or policy aspects of occupational safety and health. An individual with a Ph.D. or J.D. degree may complete the program in one year.

Occupational Health Nursing
The Occupational Health Program is involved with Boston University in providing a two-year master's degree program for nurses with previous baccalaureate degrees. One year consists of didactic training in occupational safety and health at Harvard; the second year consists of graduate training in nursing aspects of occupational safety and health at Boston University.

Office of Extramural Health Programs

The Office of Extramural Health Programs has established and is strengthening working relationships with components of the health system, including governmental agencies, providers of health services, and organizations of consumers. A principal objective is to provide training positions for students and research opportunities for faculty in operating health agencies and organizations outside the academic setting.

Working relationships with a wide spectrum of providers, payors, and regulators have developed into a unique blend of technical assistance, education, and research. The Office is currently involved in a major joint effort with the Peter Bent Brigham Hospital and the Affiliated Hospitals Center to develop an innovative service and training program in primary medical care and health services administration.

The Director of the Office is H. Richard Nesson, M.D.

Office of Health Policy Information

The Office of Health Policy Information is a resource center for journalists, government officials and others, designed to facilitate access to the University's wide-ranging resources in health policy analysis and research. It provides a mechanism for synthesizing and communicating available information in a manner that is timely and relevant to the needs of journalists, legislators, academic, corporate and labor leaders, and others involved in the consideration of health policy matters. The chief aim of the Office is to make a true public resource of the wealth of experience and information available within the University.

Current activities include the publication of a series of background reports analyzing health policy issues, a program of visiting fellowships for journalists, and a monthly colloquium series, the Health Policy Forum. The reports are designed to keep key individuals abreast of important developments in health policy research and analysis. The fellowships provide distinguished medical and science reporters with the opportunity to spend six weeks in residence at the School while conducting intensive research. The Forum provides an opportunity for legislators, agency heads, health care providers, and corporate and labor leaders to discuss their views on health and science issues with an audience drawn from this state's academic, legal, political, consumer, health professional, corporate, and labor communities.

The Office of Health Policy Information is directed by Jay A. Winsten, Ph.D.

Office of International Health Programs

The Office of International Health Programs provides advice both to foreign and to American students with interests in international health in the selection of appropriate programs and courses, and coordinates activities within the School that are relevant to international health. The School provides opportunities for preparation for careers in teaching, research, and service in international health, with particular emphasis on problems of health in developing countries. The School does not offer degrees in international health *per se*, but in the various public health disciplines, adapted to meet the needs of international health students. Courses are available to provide general background and understanding of international issues, skills and knowledge of health policy, planning, program design and management, and the relevant aspects of infectious diseases, nutrition, maternal and child health, population, etc. Various programs within the School, in conjunction with related course offerings in other divisions of Harvard University and the Massachusetts Institute of Technology, offer students a broad background for future careers with international agencies, mission groups, philanthropic foundations, and foreign governmental and academic institutions. Cross-registration opportunities are available for students interested in medicine, economics, public admin-

istration, education, anthropology, government, social relations, and related subject areas appropriate to particular regions of the world. (Students may also cross-register for courses in foreign languages, but may not receive credit for such courses toward degrees being earned at the School).

Faculty members active in international health programs have had extensive experience in countries in Latin America and the Caribbean, Africa, Asia, and the Middle East. They are drawn from various departments and schools throughout the University, giving international health an interdepartmental and interdisciplinary orientation. Students at the School of Public Health come from more than 40 different countries, and usually represent the whole range of public health disciplines. The exchange of knowledge between students provides an additional dimension to the learning experience.

The Director of the Office of International Health Programs is Joe D. Wray, M.D., M.P.H., assisted by Gretchen M. Berggren, M.D., S.M./Hyg., and Richard A. Cash, M.D., M.P.H.

The Community Health Improvement Program

The primary goal of the Community Health Improvement Program (CHIP) has been to establish off-campus programs of service to augment established activities at the Harvard School of Public Health. Beyond this the ultimate objective is to effect improvement in health services and health nationally by developing, implementing, and evaluating new public health policies and strategies that may be adapted elsewhere.

CHIP is based in four program areas: 1) environmental and occupational health, 2) housing, 3) nutrition, and 4) related health services for low income people. The basic educational goal of CHIP is to establish an externship program in each area with supervised practical experience in a variety of professional settings. An externship ordinarily consists of one summer of paid work and/or one day per week during the academic year. Supervision of externs is shared among field preceptors, CHIP staff members, and School faculty.

The service goals of CHIP are fulfilled by externs and by CHIP staff who may directly assist field personnel in problem solving efforts aimed at improving the equity, efficiency and effectiveness of health service delivery systems, and improving the utility of policy relevant information and evaluation techniques.

Finally, CHIP demonstration and research activities are guided by more general needs for new public health knowledge, understanding and management technology. These projects are developed by CHIP staff, faculty members who become associated with CHIP, and by doctoral students.

CHIP is currently operating in the fourth year of a renewable four-year grant from the W. K. Kellogg Foundation. The Principal Investigator is H. Richard Nesson, M.D. The Director is J. Larry Brown, Ph.D.

Some of the courses with particular relevance to international health are listed below. (Refer to appropriate corresponding descriptions.)

ID 209 Health Services in Developing Countries; HPM-HSA-POP 262 Health Planning in Developing Countries; NUT 210 Nutrition Problems of Less Developed Countries; MCHA 206 Maternal and Child Health in Developing Countries; POP 216 Comparative Analysis of Public Policies in Developing Countries; POP-HPM-HSA 263 The Design and Management of Population Programs; TPH 201 Ecology, Epidemiology, and Control of Important Parasitic and Viral Diseases of Developing Areas.

Continuing Education in Environmental Health

As part of its activities, the Department of Environmental Health Sciences offers a series of short-term technical courses covering a variety of specialty areas. At the present time, the faculty and staff of the Department organize and present 20 to 25 short courses each year. These range from two days to two weeks in length, with the majority being of one-week duration. Essentially all of the courses are directed to topics in the fields of industrial hygiene, radiation protection, and air pollution control. Individual topics include in-place filter testing, occupational and environmental radiation protection, planning for nuclear emergencies, certification of biological safety cabinets, environmental radiation surveillance, industrial hygiene practice, and management of industrial hygiene programs.

Although faculty members from the Department conduct a major portion of each course, frequent use is made of outside experts to cover special topics. Many courses include laboratory sessions during which participants can obtain practice in the use of the latest analytical apparatus and portable field measuring instruments. Classes are generally restricted to approximately 25 participants and laboratory sessions are conducted in small groups to assure adequate time for discussion and interaction with the faculty and staff. Each course carries Continuing Education Units and many have been approved for recertification credit by the American Board of Health Physics and the American Board of Industrial Hygiene. Participants include scientists, engineers, and environmental health specialists employed by federal, state and local regulatory and control agencies, and by industrial organizations, research and development laboratories, public utilities, consulting groups, and casualty insurance carriers. Currently, over 400 professional personnel annually attend the courses offered by the Department. Further information on the technical content of the courses may be obtained by writing to Dr. Dade W. Moeller, Chairman, Department of Environmental Health Sciences. Details on course schedules, tuition fees, and other aspects of the program may be obtained by contacting the Short Course Coordinator, Department of Environmental Health Sciences (telephone: 617: 732-1171).

Executive Programs in Health Policy and Management

Executive Programs in Health Policy and Management was established in 1974 to develop and conduct educational programs for executives engaged in management and regulation in the health and environmental fields. In 1979, Executive Programs was incorporated into the Department of Health Policy and Management. The programs are residential and range in length from three days to six weeks. The short programs focus on specific topics or roles, such as finance or trusteeship; the longer programs focus on management skills and policy analysis.

The programs are structured to bring together: an intensive, focused curriculum designed to develop managerial and analytical expertise; a multidisciplinary faculty experienced in executive education drawn from

several professional schools at Harvard; participants with a wide range of personal and professional experience; an interactive learning climate requiring serious individual study and active contribution; and a full-time, residential experience promoting extensive exchange of insights among faculty and participants.

Participants in the programs are sponsored by their employer organizations: health care providers; federal, state and local government agencies in health and the environment; national, regional, and local planning and regulatory agencies; corporations; professional, trade, and public interest organizations; legislative committees; and fiscal intermediaries.

A core faculty is drawn from the Harvard School of Public Health; representatives from the Faculties of Business, Government, Law, and Arts and Sciences also teach in the programs. The programs are taught primarily by the case method, which requires the active involvement of the participants in the analysis of problem situations and the development of solutions to them.

The Programs offered in the last year have included: Health Systems Management; Health Policy, Planning and Regulation; Environmental Policy and Management; Chiefs of Clinical Services; Financial Management and Strategy in Health; Managing Multi-Institutional Collaboration; and Hospital Trustees.

Participation in Executive Programs is applicable to the A.M.A.'s Physician Recognition Award Category I Credit.

The Director of Executive Programs is Alan Sheldon, D.P.M., S.M. in Hyg.

Interdisciplinary Programs in Health

The primary objectives of Interdisciplinary Programs in Health (IPH) are to enlist scholars from the natural and social sciences in finding new ways to deal with the critical health problems of today's society and to attract and train for health fields young and midcareer people with strong backgrounds in a natural or social science.

IPH is designed to bring to health problems the knowledge, skills, insights and analytic techniques of a variety of disciplines. It is a university-wide program, based at the School of Public Health. Members of the Faculties of Arts and Sciences, the John F. Kennedy School of Government, Law, Medicine and Business participate in IPH.

IPH presently focuses on environmental health with particular emphasis on issues of both science and public policy related to chemicals in the environment.

Over 40,000 chemicals are currently in production and more than 500 additional ones are introduced each year, many of them biologically active. The problems raised by these chemicals provide the initial emphasis of IPH. The studies will range from laboratory studies of biochemical effects at the cellular level to risk assessments and policy analyses of the regulatory process. Individual programs will reflect the interests and wishes of participants.

It is expected that participants will leave IPH prepared to work on health problems in federal, state and local governments, in industry and in re-

search and, in some instances, to launch programs at other universities. It is not a degree granting program.

The Participants

IPH provides opportunities for:

1. Promising graduates of advanced degree programs in the natural or social sciences seeking preparation for careers in which their talents can be applied to health-related problems, either through fundamental or applied research or through service.
2. Senior scientists and scholars who have made significant contributions in a discipline and now wish to apply their discipline to health-related problems.
3. Individuals from government or industry who have been involved in problems of environmental health and regulation and wish to broaden their background and perspective.

In addition, IPH seeks to create new cooperative links among scholars within Harvard University as they work on problems relating their fields to applied health research.

The program has several components. First, research may be done individually, in collaboration with existing research groups, or with new interdisciplinary teams. Second, seminars and working groups will explore particular problems and develop papers and monographs. Third, Fellows and Visitors meet together regularly, joined by members of the Harvard faculty and distinguished guests, to exchange experiences and to discuss important issues related to health.

IPH Fellows

Postdoctoral fellowships will be awarded for terms of one or two years, as appropriate, and may be renewable for a third year.

Fellows will be chosen from the natural sciences (chemistry, biology, biochemistry, physics and mathematics), the quantitative analytic areas (statistics, operations research, engineering, computer science, etc.) and the social sciences (economics, sociology, public policy, law, management, etc.).

Those selected will devote their initial period to orientation, exploration of opportunities and selection of projects and advisors. Experimental facilities will be made available in the laboratories of existing research groups. It is expected that during the term of a Fellowship a substantial investigation or analysis will be completed.

For further information on admissions requirements, contact: Dr. Donald F. Hornig, Director.

Visiting Scientists and Scholars

Visitors may be on leave from universities, industry, or public interest organizations. If stipends are required from IPH they will be adjusted to individual circumstances and the availability of other support to the applicant. Applicants should submit a curriculum vitae, a list of publications, a proposal for research or study to be undertaken in IPH and a statement of the relation of IPH to their career objectives.

General Information

History of The Harvard School of Public Health

Professional education in public health had been steadily expanding in Harvard University for more than two decades before the actual founding of the School in 1922. Its gradual development was characterized by certain important steps, the first of which was the establishment, in 1909, of the Department of Preventive Medicine and Hygiene in the Medical School — the first such department in the United States. The degree of Doctor of Public Health was first conferred in 1911. In that year a Department of Sanitary Engineering was established in the Graduate School of Engineering. In 1913, the Department of Tropical Medicine and, in 1918, the Division of Industrial Hygiene, with clinical and laboratory facilities, were organized in the Harvard Medical School.

Also in 1913, the Harvard–Massachusetts Institute of Technology School for Health Officers was formed under the joint management of Harvard University and the Massachusetts Institute of Technology. This School operated until the fall of 1922, when it was superseded by the Harvard School of Public Health, made possible by an endowment for this purpose from the Rockefeller Foundation.

In the early years of the School's operation, several of its departments functioned as joint departments with counterparts in the Medical School, sharing facilities, faculty, and budgets. In 1946, the School was separated administratively and financially from the Medical School and became an autonomous unit of Harvard University. It continues to cooperate with the Medical School in teaching and research, and has also developed close associations with other divisions of the University, particularly the Graduate School of Arts and Sciences, the John F. Kennedy School of Government, and the Graduate School of Business Administration.

The School participates in both professional and graduate education, as well as mid-career education, and offers the degrees of Master and Doctor of Public Health, Master and Doctor of Science, and Master of Occupational Health.

Location and Resources

The main buildings of the School are the Health Sciences Laboratories at 665 Huntington Avenue, and the Sebastian S. Kresge Educational Facilities Building at 677 Huntington Avenue, Boston. These buildings are near the Harvard Medical and Dental Schools; the Countway Library of Medicine; the Children's Hospital Medical Center; the Beth Israel Hospital; the Affiliated Hospital Center (Peter Bent Brigham, Robert B. Brigham, and Boston Women's Hospitals); and other Harvard-affiliated hospitals. The School, including its Center for Population Studies, also has offices in Cambridge.

Health Sciences Computing Facility

Computing and data processing resources are available to students through the Health Sciences Computing Facility (HSCF), which is operated by the School of Public Health. A staff of computer programmers and analysts assists researchers and students from all of the Harvard Medical Area institutions in using the computer as a tool for analyzing data, for doing extensive numerical calculations, and for acquiring, maintaining, and processing large data bases.

HSCF is equipped with five computer systems, four of which are used interactively in a time-sharing mode and one which is used in a batch processing mode. Remote batch processing is accomplished by a high-speed telephone link to the ITEL AS/7031 computer at the Harvard Computing Center in Cambridge. Remote interactive computing is provided by telephone links to computers at the Sidney Farber Cancer Institute, the Harvard Computing Center, the Massachusetts Institute of Technology, and Dartmouth College.

HSCF offers computing capability for School programs using a VAX 11/780 and a PDP 11/70, both running under the UNIX operating system, and a PDP 11/70 running under the MUMPS operating system. Over one hundred simultaneous users can be accommodated. Teleprinter and video terminals are located in the School to allow students to access any of these computers. Students also use an IBM batch processing system which features a number of statistical packages including SAS, SPSS, and BMDP. Languages available at HSCF include Basic, Fortran, 77, PL/1, MUMPS, and C.

HSCF staff participate in several computing courses given by the Department of Biostatistics. In addition, HSCF offers short courses on specific languages, packages, and specialized medical and health data bases. Students who have had computing experience may enroll in special tutorials (Biostatistics 313a,b,c,d). The Director of the HSCF is Dr. Raymond K. Neff.

A library tour is part of the School's orientation program.

Libraries

The library needs of the School are served principally by the Francis A. Countway Library of Medicine, located at 10 Shattuck Street. The Countway Library combines the resources and services of the Harvard Medical Library and the Boston Medical Library. Among libraries serving medical and health-related schools, it is the largest in the country, with recorded holdings of more than 460,000 volumes and 4,800 periodicals. The Countway Library also has extensive collections of historical materials, dating from the fifteenth century. Its history of medicine department provides modern facilities for the use of these books and other rarities.

All members of the University may borrow from the Harvard College library at Cambridge. Messenger service is provided daily between the college library, various other Harvard University libraries, and the Countway Library. The Boston Public Library, libraries of the Massachusetts Institute of Technology, and other libraries of the Boston area add to the total book and periodical resources available to students.

The Computing Facility is used extensively by students and faculty.

Other Resources

Students at the School may enroll in courses in other divisions of Harvard University, e.g., in the natural sciences, public administration, economics and other social sciences, statistics, and medical sciences. Many graduate courses at the Massachusetts Institute of Technology and the Fletcher School of Law and Diplomacy at Tufts University are also open to students at the School. Students will generally be granted credit for such courses toward degrees being earned at the School of Public Health, with the exception of courses in foreign languages. Credit granted for cross-registered courses may not exceed one-half of the credit units required for the degree in question.

The School maintains a close association with a wide variety of health, medical care, and welfare organizations in Massachusetts and elsewhere. The facilities of hospitals and certain other institutions adjacent to the School are available to qualified students. Other local, national, and international health facilities provide opportunities for observation and special studies, and members of their staffs are available to assist in the School's educational program. The State Laboratory Institute of the Massachusetts Department of Public Health offers opportunities for qualified students to obtain experience in laboratory methods pertinent to public health.

Admission

Application for Admission

Application forms for admission to all degree programs and for special student status can be obtained from the Admissions Office, Harvard School of Public Health, Room G-4, 677 Huntington Avenue, Boston, MA 02115.

Applicants must submit the following for consideration by the Committee on Admissions and Degrees: (1) completed application form; (2) transcripts of academic record at college, graduate school, and/or professional school; (3) names of at least three people, well acquainted with the applicant's previous work, from whom letters of recommendation have been requested. In addition, the Graduate Record Examination is required of certain applicants, as noted elsewhere in this catalog.

An application fee of $30, which is not refundable, is required for each formal application. A check drawn on a bank in the United States, a postal money order, or an international money order, payable to the Harvard School of Public Health, must accompany the application.

In addition to fulfilling the specific requirements for admission to a degree program, applicants must satisfy the Committee on Admissions and Degrees as to their ability to undertake advanced study at a graduate level. The final decision as to the admissibility of an applicant rests with the Committee.

The School operates a rolling admission process from January to April. Applications are accepted throughout this period but applicants are advised to apply by February 1.

Admission of a candidate is for a particular year; if enrollment at that time is not possible, reapplication is necessary and will be considered on the same competitive basis as a new application. Exceptions to this must be approved by the Committee on Admissions and Degrees.

As a matter of policy, Harvard School of Public Health does not discriminate among applicants and students in admissions, educational policies, scholarship and loan programs, and athletic and other programs on the basis of race, religion, sex, national origin, color, creed, handicap, age, sexual orientation, marital or parental status, or status as a Vietnam era or disabled veteran. The School encourages women and members of minority groups to apply for admission. Increasing numbers of students with disabilities are enrolling at Harvard and are participating in a wide range of programs and activities. Everything possible will be done to meet special needs. There are, however, no separate academic programs for either the physically handicapped or for students with learning disabilities; all enrolled students undertake the same program. The Associate Dean for Student Affairs has been designated to assist handicapped students and employees in adapting to life at the School.

International Students

Language Proficiency

Applicants from countries in which the language of instruction is not

English must satisfy the Committee on Admissions and Degrees as to their ability to speak, read, write, and understand the English language competently. Only students who have shown evidence of academic excellence and who can understand rapid, idiomatic English and can speak, write and read English with a high degree of facility should apply for admission. Students should be advised that they may be required to attend ten or more classes each week and to write papers and frequent short examinations. The School requires that all students maintain a minimum grade average of B− (grade point average 2.7) for graduation, and some departments and programs have more restrictive standards. No allowance is made for students whose English is not sufficient for these demands; therefore, any deficiency must be made up before applying for admission. If a student completes all required coursework but does not have a grade point average (GPA) of 2.7, the student will not be permitted to graduate and will not receive a degree or certificate.

The School requires that foreign applicants obtain a satisfactory score (ordinarily 550 or better) on the Test of English as a Foreign Language (TOEFL). The test is administered four times a year at centers throughout the world. Applicants are advised to take this test as early as possible in the admissions process. Information concerning the test may be obtained by writing to the Test of English as a Foreign Language, Box 899, Princeton, New Jersey 08540. *Certification of English proficiency must be received by the School before the immigration form needed to obtain a visa to enter the United States can be issued to the student.*

Financial Certification

The School has adopted the following policy regarding foreign nationals who are applying for admission from outside the United States. An applicant whose financial support is not guaranteed by an official U.S. agency or foundation must submit evidence satisfactory to the School that he or she will have sufficient funds available in U.S. currency to pay the expenses for the full period of his or her academic program, and that he or she is permitted to exchange or export these funds. Certification of adequate financial resources must be received by the School before the immigration form needed to obtain a visa to enter the United States can be issued. Foreign students who are wholly supported by personal funds will be required to have adequate funds to cover the cost of tuition in an escrow account in in a U.S. bank before the immigration form will be issued.

Foreign nationals admitted to the School and already residing within the United States will also be required to submit satisfactory evidence of sufficient funds to cover their expenses for the full period of their academic program. Such students will not be permitted to register at the School unless they have adequate funds to cover the cost of tuition in an escrow account in a U.S. bank.

An estimate of living expenses in the Boston area may be found in the section entitled "Living Expenses" on p. 83.

Academic Credentials

Before international students are permitted to register, the School must receive official sealed transcripts of all academic records presented for admission. Photocopies of original transcripts or diplomas are only accepted if properly notarized by U.S. Consular officials.

Hospital Insurance

All nonimmigrant foreign students are required to enroll in the Harvard Blue Cross/Blue Shield student insurance plan. There can be no exceptions to this requirement. More information about the plan is included in the section entitled "Financial Information."

All inquiries and communications regarding admission should be addressed to the Director of Admissions at the address given above.

Degree Candidates

Full Time

Credit units are assigned on the basis of the total amount of time required by a course, both in class and outside of class. Twenty credit units constitute a full program for one term, and a student must take a minimum of 40 credits for the year to be certified as full time. A full-time student may register for no more than 25 credit units per semester unless permission is obtained from the Committee on Admissions and Degrees.

Part Time

Students may register as part-time degree candidates with the approval of the Committee on Admissions and Degrees. Ordinarily this requires half-time attendance; however, full-time full tuition requirements for the degree must be met (see tuition and registration guidelines, p. 80). A one-year program may be completed in two academic years, a two-year program in three academic years. Ten credit units per term constitute a regular program for half-time students. Half-time students may register for no more than 12.5 credit units per term.

Requirements for Nondegree Status

Courtesy Students

Persons holding Harvard Corporation appointments are permitted to enroll in courses at the School with the permission of the instructor and the Registrar. Harvard employees should consult the Personnel Office about the provisions of the Harvard Tuition Assistance Plan. Employees from other hospitals and universities participating in tuition plans should consult the Registrar about the availability of space in courses of interest to them. Courtesy students may take a maximum of five credits per semester. In courses with restricted enrollment, preference is given to degree candidates.

Special Students

The School may accept a few students who are not degree candidates. Procedures and requirements for the admission of such students are the

same as for degree candidates. Admission of these special students to courses is subject to availability of space and the permission of the instructor. Candidates should specify on the application form the courses they plan to take. Admission as a special student carries with it no commitment to accept the applicant as a degree candidate and is limited to one academic year. Special students who wish to be admitted to degree candidacy must reapply and will be considered on the same basis as other applicants for admission. Special students are not admitted only to audit courses.

After admission to degree candidacy, students may petition the Committee on Admissions and Degrees to count toward academic requirements courses taken as a special student or courtesy student (i.e., while in non-degree status). Permission may be granted if the courses fit into the student's academic program. Tuition credit is not given for these courses, and students who are granted such permission must still meet the tuition requirements for the degree. (See p. 80 for tuition guidelines.)

Registration

General Information

The Academic Year

The academic year is divided into two terms. In the School of Public Health the fall term begins in mid-September and the spring term begins in late January or early February. Each term is divided into two periods: "a" and "b" in the fall term, and "c" and "d" in the spring term. Between the terms, in January, a week of field work and special projects is called "e" period. The *Academic Calendar* which gives term dates, recess periods, holidays, etc., is printed in the front of this *Register*.

Official Notices

It is important that each student keep informed of all official notices which are posted on the Office of the Registrar bulletin boards located on the G-Level of the Kresge Building.

Registration

Registration ordinarily occurs the week before the Monday on which fall term begins. Registration for new students in the spring term occurs on the Friday before the Monday on which the term begins. Continuing students register in the spring term by filing their study cards by the appropriate deadlines given in the academic calendar. Late registration may be accomplished (with a late fee of $10) up to the last day to register in a given term as specified in the academic calendar.

All International Students who are registering at the School of Public Health must report to the Harvard International Office, Holyoke Center, 1350 Massachusetts Avenue, Cambridge, MA, at the beginning of each academic year or the beginning of the spring term if not registered for the preceding fall term. There they must present their passports and entry permits or other evidence of their immigration status. This requirement

applies to all students who hold an F-1 student visa, a J-1 exchange visitor visa, or permanent resident status.

Every student who is a degree candidate is expected to register until the requirements for the degree are fulfilled or until degree candidacy is terminated. Every resident student, whether full time or part time, must register in person at the beginning of each term. Doctoral candidates doing advanced work may petition the Committee on Admissions and Degrees to register with non-resident status. Since non-resident status is ordinarily considered less than half time, students in this category automatically fall into loan repayment and must make special arrangements for continuation of health insurance, as they are not eligible for the regular Harvard plans. Foreign students who wish to study as non-residents but within the U.S. may petition for full-time status in order to maintain visa requirements.

Each student must file in person a study form and course cards, approximately one and one-half weeks after the first day of classes. In the fall term, new students are given additional time to file. Students who sign up for courses listed both at HSPH and other faculties must register for the HSPH section. Before submitting study cards, a student should visit classes and consult with her/his advisor, who signs the study card, to decide on a definite program. Students who hand in late study cards will be charged a $10 late fee.

Since the filing of study cards is considered an official part of registration for a term, failure to file a study card by the last day to file in that term may result in cancellation of registration.

Courses can be dropped from the schedule if not enough students are enrolled.

Petition to Change Courses

After a study card is filed, all changes in courses being taken for academic credit, whether within HSPH or by cross-registration, must be made by petition. Official drop/add forms include space to change grading options and are available in the Registrar's Office. A $10 fee is charged for each petition filed regardless of the number of changes on a single petition. Changes cannot operate retroactively.

Cross-Registration

Students may take courses in other faculties of Harvard University, at the Massachusetts Institute of Technology and the Fletcher School of Law and Diplomacy at Tufts University. Students are advised that dates of deadlines for cross-registration and for beginning of classes vary from school to school (MIT, the Business School and Law School begin fall classes at least one week earlier than the School of Public Health), sometimes making it difficult to coordinate registrations. It is important to consider the desirability of cross-registration in light of two factors. First, that some schools pattern the length and activity of their classes much differently than the School of Public Health. At the Business School, for example, classes meet intensively for several hours at a time instead of meeting in several one- or two-hour sessions per week. This may interfere with a student's ability to attend

classes at HSPH. Second, commuting time to all but the Medical School may be as long as 45 minutes each way in winter, so that a total commitment of three hours may be required merely to attend a one-hour class. A student should discuss desirability and feasibility of cross-registration with his/her advisor.

Credit granted for cross-registered courses may not exceed one-half of the credit units required for the degree program of the student. Detailed instructions and cross-registration petitions are available at the Registrar's Office. Petitions must be filed early in each term. Students should check instruction sheets and the calendar for deadlines. (*Note*: Students should avoid visiting the Registrar's Office in another Faculty on the day of that School's initial registration.) HSPH students who drop C-R courses should do so by filing standard drop/add forms in the HSPH Registrar's Office by the deadline published by the appropriate faculty. Drops will not be accepted after such deadlines.

Grades for C-R courses are transferred from other faculties according to their grading systems and not those of HSPH. Individual instructors may not determine grading options for cross-registered students but must conform to their faculty's official regulations. Students who cross-register are bound by the rules and regulations of the respective faculties regarding grades, examination schedules, make-up examinations, and incomplete work. These regulations are often very different from those at HSPH, and students with questions should consult with the Registrar of the faculty involved. Degree candidates are urged to check the examination schedules of cross-registered courses to avoid possible problems of early reporting of grades to HSPH faculty for the degree lists. Some Law School courses, for example, give examinations at so late a date that grade returns are not possible for HSPH degree candidates.

Tutorials

All tutorials receiving degree credit at HSPH must be taken with the permission, and under the supervision of an HSPH faculty member. Students file tutorial forms giving descriptions of the course content, hours required, and credit to be awarded when they file study plans. Students are expected to complete two hours of work per week throughout the term to receive one unit of credit.

Audited Courses

Courses may be audited at the discretion of an instructor. No credit is given and no audited courses appear on permanent records or transcripts. Some HSPH courses exclude auditors.

Radcliffe Seminars and Harvard Extension School Courses will not receive degree credit at HSPH.

Withdrawal and Leave of Absence

Students wishing to *withdraw* after a term has begun must notify the Registrar and their department in writing and schedule an exit interview with the Director of Financial Aid and the International Students' Office where appropriate.

Students wishing to take a *leave of absence* must file a petition using a form available in the Registrar's Office which is signed by the advisor and departmental chairman. The Committee on Admissions and Degrees ordinarily grants leaves of absence for a maximum of two terms.

Students planning to petition for a leave of absence should make an appointment with the Associate Dean for Student Affairs.

Tuition is prorated according to the calendar dates published on page 80. The effective date of a withdrawal will be the date the letter of withdrawal is filed with the Registrar, or a future date, if so requested in the letter by the student. For students granted a leave of absence, tuition is charged to the end of the tuition period in which the student is granted the leave of absence. The deadlines for leaves and withdrawals from the School without becoming liable for payment of tuition are given in the Academic Calendar. A student who fails to register by the last day to register in a term will be automatically withdrawn unless a leave of absence has been approved. Students who withdraw must apply for re-admission. Students who withdraw after the last meeting of a class will be considered registered for the entire course and the grade will be recorded. Blue Cross-Blue Shield health payments may not be prorated but must be paid by the term.

Notification of Grades

Grade reports for the fall term are sent out by the Registrar at the end of February. Spring grade reports are mailed to permanent addresses at the end of June. No grades are given to students either by telephone or in person until all grade reports are prepared. Students who wish to know their grades immediately after a course ends may leave a stamped, self-addressed postcard with their instructor or hand it in with the bluebook in courses giving final examinations.

Transcripts

Official transcripts may be ordered by filling out a form in the Registrar's Office. The first copy is free, subsequent copies are $1.00 each. Students should allow three working days for processing transcript orders. Transcripts given directly to students are stamped "Issued to Student," and anyone requesting records should check to be sure other institutions accept transcripts sent by someone other than the Registrar.

If a student leaves the School with outstanding financial obligations to the University, transcripts are sent directly to the student and not to third parties. Such transcripts carry notations "Issued to Student" and "Student's Financial Obligations to the University Have Not Been Met."

Student Addresses

All students must give their local address at registration and should keep the Registrar's Office informed of any changes in their local address.

ID Cards

Students are issued official Harvard University identification cards for use throughout the Cambridge community to gain access to libraries and classroom buildings. Since these cards are often used as general identification

for cashing checks, it is essential to take precautions against loss. Replacements may be ordered through application at the Registrar's Office, where temporary IDs are issued. A replacement fee of $10 is charged to a student's term bill.

Summer Study

HSPH has no regular summer course program, but some students elect to do tutorial or research work during the summer recess. A maximum of five credits will be given for degree credit in summer study. Students must file summer registration forms with the Registrar's Office before the end of May in order to receive degree credit for summer work. Tuition for summer courses may not be applied toward tuition requirements for the degree.

Harvard/MIT Summer School

Students should consult departmental advisors before enrolling. Departmental approval is required for degree credit and the Committee on Admissions and Degrees considers petitions for degree credit only after final grades are received in the Registrar's Office. Students must request transcripts and file petitions by published deadlines.

All other summer work must have prior approval of both department and the CAD for consideration for degree credit. The deadline for such petitions is May 25. Degree credit is not ordinarily granted for work done at universities other than Harvard and MIT.

The Grading System

The grading system is as follows: Courses on the 100 and 200 level may be taken with ordinal or pass/fail grades. The ordinal system used for 100 and 200 level courses will be A,B,C, and F. The grades will have the following numerical values: A=4.0 (Excellent), A−=3.7, B+=3.3 (Good), B=3.0, B−=2.7 (Satisfactory), C+=2.3, C=2.0 (Poor), C−=1.7, F=0 (Failing). Courses at the 300 level may only be taken pass/fail.

Minimal grade point average requirements and distributional requirements have been instituted for all students entering degree programs in the fall semester of 1979 and thereafter. Semester and cumulative grade point averages will be computed on courses taken on an A,B,C,F basis anywhere at Harvard and M.I.T. Courses taken pass/fail or on grading systems other than A,B,C,F will not be calculated in the grade point average. The minimal standard per semester for satisfactory work will be 2.7; students must have that average or above to qualify for a degree. Individual departments and programs may set more restrictive standards.

Students taking a one-year degree program are required to take a minimum of 30 credits on the A,B,C,F basis and the remainder as the student elects. Students taking degree programs lasting two or more years are required to take a minimum of 60 credits on the A,B,C,F basis and the remainder as the student elects. This requirement will be assessed by the Registrar prior to the awarding of any degree. Doctoral students must receive grades of either A or B in courses counted for their major or minor fields.

Exceptions to this policy can be sought by students or faculty by petition to the Committee on Admissions and Degrees. Cross-registered courses taken elsewhere at Harvard can be included in the minimums if they are at the 100 level or above and if taken with an A,B,C,F grading system.

Faculty are encouraged to offer both grading options in all 100 and 200 level courses. However, faculty who wish to offer only the A,B,C,F option may do so but must publish this information in advance of the beginning of the course. Students have the right to receive grades on the A,B,C,F system, if designated on the study card at the beginning of the period.

When courses are taken on a pass/fail basis, grades A through C− are equated with a Pass. A grade of F has the same value in either the ordinal or the pass/fail system.

Students may normally repeat failed courses for both grade and credit. The grade received when the course was taken the first time remains a permanent part of the record, but only the repeated grade will be used in computing the cumulative grade point average.

A grade of incomplete (INC) may be awarded at the discretion of the instructor. An INC will be recorded as a failure on a student's permanent record unless the deficiency has been corrected by the end of the next term, on the deadline noted in the academic calendar. An instructor may require that the student correct the deficiency earlier, in which case the student and the Registrar should be informed in writing of the deadline. Students receiving an incomplete for a course required for graduation will not be awarded a degree until the coursework is satisfactorily completed and a passing grade submitted to the Registrar's Office in writing.

Final Examinations

Final examinations are ordinarily scheduled during the last week of each period. Final examinations must be taken and may not be repeated, except that, with the concurrence of the Associate Dean for Student Affairs and the Head of the Department concerned, a faculty member responsible for a first-quarter fall course will have the option of offering a re-examination to students who have failed the regular final examination. A student who does not attend a final examination in a course will be given a grade of ABS. At the discretion of the Associate Dean, makeup examinations may be given to students who were absent from the regularly scheduled final exam because of significant medical or personal reasons. In such cases the Associate Dean should, if possible, be given notice in advance of the beginning of the examination. Unexcused absences remain ungraded, and no credit is given for the course. Incompletes may not be given for unexcused absences from final examinations.

Grade Points

Grade points for a course will be determined by multiplying the number of credit units times the value associated with the grade assigned. The grade point average is defined as the sum of grade points earned divided by the total credit units for which grade points were calculated.

Grade Point Averages

The minimum standard for satisfactory work at the School is a B− average or a grade point average of at least 2.7. In some departments and programs, however, students will be expected to maintain an average above this minimum. Such requirements will be stated in advance. A student whose record is below the standards of the department, may, at the end of a given term, be informed by the Committee on Admissions and Degrees, upon recommendation of the department, that he or she may re-register subject to specific academic conditions which if not fulfilled by the date specified may result in the termination of candidacy.

Alternatives

During registration, each student should mark the box on each course card indicating which grading system — ordinal or pass/fail — is desired. Note that 300-level courses are graded only P/F. In the event of cross-registration, the grading system of the host school must be used for that particular course. Students planning future application to doctoral programs are advised to elect the ordinal system. Doctoral students must elect the ordinal system in all courses offered for their major or minor fields. Students should discuss the advantages and disadvantages of both the ordinal and P/F grading systems with their advisors before selecting an option.

Ordinal grades provide a more definitive record of student performance and are therefore useful in future job and academic applications. An advantage of the P/F system is that students will not be inhibited from taking courses of interest outside their areas of concentration for fear of obtaining poor grades. Also, some students already have advanced professional degrees or job experience which make the ordinal system unnecessary for their future plans.

In selecting grading options, students should consider both minimum school distribution requirements and any additional requirements set by their department or program.

Calculation of Credit Units

Credit units are assigned on the basis of the total amount of time required by a course, both in class and outside of class. Twenty credit units constitute a full program for one term. Ordinarily a full-time student may register for no more than 25 credit units per semester unless permission is granted by the Committee on Admissions and Degrees before the drop/pass deadline. Part-time students may register for no more than 12.5 credits per semester.

Changes in Grades

Final authority for the designation of grades rests with the principal instructor in each course. Once a grade has been reported in writing to the Registrar's Office, it can only be changed upon written request of the instructor to the Dean for Academic Affairs. This does not apply to changes from INC to appropriate grades for credit. Such letters must contain an

explanation as to why the grade is being changed. If the grade is based on clerical error, the Dean for Academic Affairs may authorize the Registrar to change the grade. If it is an error of judgment or because of new information regarding the student's performance, the change will be approved only if also approved by the Committee on Admissions and Degrees. The instructor is ordinarily expected to indicate that he or she has reviewed the work of other students in the course in order to determine that no similar errors have been made and gone uncorrected.

Financial Information

Tuition and Fee Schedule

The tuition fees for the academic year 1980-81 are listed below:

$5,650*	Full-time resident tuition
2,925*	Half-time resident tuition
2,975*	Doctoral reduced tuition
1,575*	Doctoral half-time reduced tuition
650*	Doctoral facilities fee (resident)
255	Nonresident doctoral guidance fee
30	Active file fee for degree candidates on leave of absence
	Part-time special students enrolled for 6 to 9 credit units per term:
245*	First credit unit of work per term
135	Each additional credit unit
	Part-time special students enrolled for 5 or fewer credit units per term:
135	Charge per credit unit per term
	Degree candidates who register and receive credit for research or supervised study during the 1980 summer session:
675	Five-credit program
10	Late Registration Fee
10	Late Study Card Fee
10	Drop-Add Petition Fee (for each petition filed)

Final Doctoral Tuition Fee

For the registration period in which a dissertation is formally approved and accepted by the Department and the Committee on Admissions and Degrees, a Doctor of Science or Doctor of Public Health candidate must have paid at least half of the then current facilities fee. The fee for 1980-81: $162.50.

The starred amounts include the University Health Service fee for medical care for all resident students enrolled for 6 or more credit units. This fee may not be waived. University Health Service coverage extends from September 1 through August 31.

Hospital insurance is billed separately. A Blue Cross/Blue Shield student insurance plan provides coverage for many costs of medical care not offered at the University Health Services. Coverage under this plan extends from September 1 through August 31. The tentative premium for 1980-81 is $200. The Blue Cross/Blue Shield student insurance plan is compulsory for all nonimmigrant foreign students; all other students are also enrolled in the plan unless they have other adequate medical insurance and submit a waiver within two weeks following registration. Students who fail to file waivers will be responsible for any fees billed for that term. Waivers are approved by the Director of the University Health Services.

It should be noted that nonresident doctoral students are not eligible to participate in any Harvard health plan. For continued Blue Cross/Blue Shield coverage, non-resident doctoral students must file special forms with the student insurance office in Holyoke Center by the deadlines published for each semester. This insurance is compulsory for all nonimmigrant foreign students in non-resident status.

Payment of Fees

No student will be permitted to register in any term until all money due from prior term bills and at least one quarter of the commencing term's tuition and fees have been paid in full. Students not enrolled in the extended payment plan must pay the full amount by the dates indicated in order to register.

Special students enrolled for less than 10 credits are required to pay all tuition and fees for the term in full when they file study cards. In event of withdrawal, tuition will be prorated according to the schedule below. All other bills for tuition and fees will be issued and payable as follows:

Student term bills for the fall term will be issued on July 25, and will be payable *in full* by August 20.

Bills for the spring term will be issued in early January, and will be payable *in full* by January 22.

Payments may be scheduled over monthly installments (four each term) through an optional payment plan that is available at a service charge of $15 per term.

Students who are candidates for degrees must have paid all bills to the University at least one day before the day upon which the degrees are to be voted.

A student who leaves the University for any reason whatever must pay all charges against him or her immediately upon receipt of a bill from the Office of Fiscal Services. Every student is held responsible for the payment of fees until he or she has notified the Registrar *in writing* of his or her

intention to withdraw from the School. A student who fails to submit written notification of withdrawal will be liable for tuition and fees for the term.

A student who leaves the School during the academic year is responsible for tuition charges in accordance with the following:

Leaves by		**Percent of Total**
First Term	*Second Term*	**Semester Charges**
October 25	February 25	25%
November 25	March 25	50%
December 24	April 25	75%

Students leaving after December 24 and April 25 of the first and second terms, respectively, are responsible for full tuition charges.

If a student who is receiving any form of financial aid withdraws and is entitled to a refund, a portion of that refund may be returned to the financial aid fund. A special refund rule applies to these funds: National Direct Student Loans, Guaranteed Student Loans, Federally Insured Student Loans. These funds must receive the same proportion of the refund as the proportion which each constituted of the original aid package.

All term bills are sent to the student at his or her local address unless the Office of Fiscal Services is requested in writing to send them elsewhere.

Any student whose indebtedness to the University remains unpaid on the date fixed for payment is deprived of the privileges of the University. Reinstatement is obtained only by consent of the Dean of the School in which the student is enrolled after payment of all indebtedness and a reinstatement fee of $10. As a further condition of reinstatement, the student is required to file with the Office of Fiscal Services a bond in the amount of $1,000 as security for the payment of future term bills.

Registration and Tuition Guidelines

The following guidelines for payment of tuition apply as stated to all students who enrolled at the School of Public Health for the first time on or after September 1, 1979. The guidelines also apply to students enrolled at the School before that date, with the exception of certain aspects of the policy concerning payment of tuition by doctoral candidates. Information concerning the applicability of the guidelines to doctoral students enrolled in a degree program at the School during the academic year 1977-78 can be obtained from the Registrar's Office.

Degree Candidates

After admission to the School of Public Health and until fulfillment of requirements for the degree, all degree candidates must be registered continuously in one of the following registration categories:

1. Resident students
2. Nonresident doctoral students
3. Students on leave of absence

All degree candidates must pay the appropriate tuition rate for each registration period as described below; they may not pay tuition on a "per credit" basis. It should be noted that, in order to qualify for deferment of an educational loan, a student must be registered for no less than a half-time study program.

Tuition for summer school courses may not be credited toward any tuition requirements for the degree.

1. *Resident Students*
   All degree candidates who are enrolled in courses or who intend to use any Harvard academic facilities for an extended period of time must register as resident students.

   Students who are registered in a master's degree program in the School will be charged full tuition.

   Students who are registered in a doctoral degree program in the School will be charged full tuition for two years (with up to one year of credit for full tuition paid as a currently enrolled master's degree candidate at the School), followed by one year of reduced tuition. For subsequent terms of enrollment the facilities fee will be charged, which provides for full access to Harvard academic facilities and the University Health Services, and for the issuance of a Harvard resident identification card.

   Part-Time Resident Students
   Any degree candidate who registers for less than full time must in any event fulfill the full-time full tuition requirements for the degree. A master's degree student completing a two-year program in three years must plan to pay at the full-time full tuition rate during the first year and half-time tuition each subsequent year at the rate for that year.

2. *Nonresident Doctoral Students*
   Doctoral students who no longer reside in the Greater Boston area* and who are engaged in less than half-time work on the degree and who have received permission from their department and the Committee on Admissions and Degrees to pursue a portion of their programs *in absentia* will be charged the nonresidential doctoral fee. Students in this category normally will have completed payment of at least the required two years of doctoral full tuition and one year of reduced tuition before applying for *in absentia* status; they must in any case complete this payment prior to their graduation and will be billed accordingly while in non-resident status.

   Doctoral students *in absentia* are charged the nonresident doctoral guidance fee, which covers periodic consultation with the student's doctoral adviser but does not provide for the use of Harvard facilities or for the issuance of a Harvard identification card. Also, as noted above, a student registered for less than a half-time study

*Students residing within a 50-mile radius of downtown Boston will normally be considered resident for tuition purposes.

program may not qualify for deferment of an educational loan. Upon expiration (or earlier termination) of CAD permission for *in absentia* status, or for a term in which use of Harvard facilities is required, the appropriate resident rate will be charged.

3. *Students on Leave of Absence*
   Degree candidates who will not, during a given registration period, be engaged in study or research for a degree from the School, and who will be making no use of Harvard facilities, must apply to the Registrar for a leave of absence. Leaves of absence are ordinarily granted for a maximum of two registration periods and require approval of the student's department and of the CAD.

   Students on leave of absence are required to pay the active file fee to maintain their degree candidacy. Upon expiration (or earlier termination) of CAD permission for leave of absence, students will be charged the appropriate tuition rate.

Termination of Degree Candidacy

Students who do not intend to register in any one of the categories noted above must terminate their candidacy for the degree. Such students are required: (1) to file in the Registrar's Office a written notice of intent to withdraw; (2) to inform their department; and (3) to arrange an exit interview with the Financial Aid Office, when appropriate. If students do not terminate their degree candidacy formally but fail to register for a full term or longer, degree candidacy will be terminated automatically. Students who are withdrawn must apply for readmission.

The CAD, with departmental recommendation, may terminate a student's degree candidacy on the basis of unsatisfactory performance in coursework. Candidacy also will ordinarily be terminated in the case of a student who has exceeded the five-year limit for completion of degree requirements following registration as a doctoral candidate. Doctoral candidacy may be terminated as a result of failure to submit an acceptable proposal for the thesis. Also, the Faculty Council may recommend termination of candidacy in matters involving academic discipline.

A student who wishes to reactivate degree candidacy should file an application for readmission, which must be approved by the department and by the CAD. Prior to readmission, the student must pay any outstanding bills to the University, as well as the then-current active file fee for each registration period that has elapsed since the termination of candidacy.

Nondegree Candidates

Requirements for admission to nondegree programs are described on p. 70.

Special students registered for full-time or for half-time study programs will pay the corresponding full tuition rate; those registered for less than half time will pay tuition on a "per credit" basis as outlined in the tuition and fee schedule.

Field Studies
Field opportunities, listed under each department's course offerings and bearing the course number 330, often entail travel expenses that must be met by the student. Information about estimated expenses should be obtained from the appropriate department.

Living Expenses

Living costs in the Boston area are higher than in most areas from which students come. The following are *minimum* amounts estimated that students will need in the academic year 1980-81 in order to cover expenses for approximately nine months. A single person will need at least $12,100, in addition to travel expenses, to cover the cost of tuition and health insurance ($5,850), books ($300), rent ($2,700), and other living expenses ($3,250). A family of four will need at least $17,650, in addition to travel expenses, to cover the cost of tuition and health insurance ($5,850), books ($300), rent ($4,500), and other living expenses ($7,000), including medical care.

Housing

The Henry Lee Shattuck International House is an apartment residence operated on a nonprofit basis by the School for its full-time students and their families from the United States and abroad. Located at 199, 203, and 207 Park Drive, within walking distance of the School, the House consists of sixty-nine individual apartments, each with its own kitchenette and bath.

All apartments are rented furnished with basic items except for linens, blankets, and kitchen utensils. No unfurnished units are provided. The monthly rent charge includes all utilities — hot water, heat, gas, and electricity — but not telephone service.

Applications should be submitted by May 15, although late applications will be considered as long as space is available. For application forms and more detailed information, write to Carol O'Connell, Office of Student Affairs, Room G-4, Harvard School of Public Health, 677 Huntington Avenue, Boston, Massachusetts 02115.

The Office of Student Affairs maintains an up-to-date list of private housing and local real estate agencies.

The Harvard University Housing Office in Cambridge arranges for housing in University-owned complexes. Information and application forms may be obtained by writing to the Harvard University Housing Office, 7 Holyoke Street, Cambridge, Massachusetts 02138. A copy of the student's letter of acceptance from the School must be enclosed to prove affiliation. This Office also maintains listings of apartments and houses not owned by the University. These listings must be viewed in person; information is not given out by mail or telephone.

Student Health Service

Under the University Health and Insurance Plan, students at the School of Public Health receive medical care and insurance toward hospital expenses.

Medical care is provided through the facilities of the Medical Area Health Service, located in Vanderbilt Hall. The hospitalization insurance extends for a period of 12 months from September 1, and covers hospitalization in Boston and elsewhere. Nondegree, post-doctoral research and teaching fellows who are in a training status are required to enroll in the Student Health Plan unless they can show that they have comparable coverage.

In addition, a prepaid program for spouses (including maternity benefits) and children of full-time students is available. As the plan provides extensive benefits for ambulatory and inpatient care, all who are eligible are strongly advised to enroll. Its coverage, like that of the Student Plan, extends for a period of 12 months from September 1, and provides full semiprivate hospitalization benefits. A descriptive brochure about the plan for dependents is sent to students before registration or may be obtained from the Registrar.

Any illness necessitating absence from classes should be reported to the Medical Area Health Service Office by the student or an attending physician, and to the Registrar's Office at the School. A physician from the Medical Area Health Service, on call twenty-four hours a day, can be reached through the switchboard of Harvard University.

For further information, contact the Director, Medical Area Health Service, 275 Longwood Avenue, Boston, Massachusetts 02115. Telephone: (617) 732-1370.

Fellowships and Loans

The Harvard School of Public Health is a participant in the Harvard University Federally Insured Student Loan Program. This program permits a student who either is a U.S. citizen or has immigrant status to borrow up to $5,000 a year, providing the student has less than $15,000 in outstanding loans.

Some fellowship support is available through departments and special programs from federal and nonfederal sources for qualified students in a variety of fields. In addition, there are limited amounts of funds available under the National Direct Student Loan and College Work Study programs.

If a student who is receiving any form of financial aid withdraws and is entitled to a refund, a portion of that refund may be returned to the financial aid fund. A special refund rule applies to these funds: National Direct Student Loans, Guaranteed Student Loans, Federally Insured Student Loans. These funds must receive the same proportion of the refund as the proportion which each constituted of the original aid package.

As a matter of policy, the Harvard School of Public Health does not discriminate among applicants and students in fellowship and loan programs on the basis of race, religion, sex, national origin, color, creed, handicap, sexual orientation, Vietnam era or veteran status, marital or parental status, or age.

Detailed information about fellowships and loans can be obtained by writing to Ms. Margaret C. Salmon, Director of Financial Aid, Harvard School of Public Health, 677 Huntington Avenue, Boston, Massachusetts 02115.

Scholarships

The Committee on General Scholarships and the Sheldon Fund administers a number of scholarships which are open to applicants from all Schools of the University. These include Travelling Fellowships, Restricted and Unrestricted Scholarships. Eligibility for many of these funds is very specific and varies according to terms of donors. Nomination for these scholarships must be made by the Director of Financial Aid. For a complete list of University Scholarships, applicants should consult the General Catalogue Issue of Harvard University.

Some awards are made available through departments or the Financial Aid Office and are based on scholastic achievement. One example is the John E. Thayer Scholarship which is the Bequest of John E. Thayer, the income to be paid "to the ten most meritorius scholars in Harvard University every year — the income shall only be paid to such meritorious scholars as who actually need the same." This award is determined by the Committee on Financial Aid following the first semester of each academic year. The award is based on a review of the grade cards of students who have elected the ordinal grading system and a needs analysis based on financial records on file in the Office of Financial Aid.

Office of Student Affairs

The Office of Student Affairs is concerned with many aspects of student life. The staff works with other groups and individuals to identify the special needs of students, plan and direct orientation, publish the student handbook and a weekly newsletter, and coordinate social events. Student recruitment activities are coordinated by staff in this Office. Up-to-date information is maintained on housing, child-care facilities, transportation, and athletic outlets in the Medical Area, Boston, and Cambridge.

The Director of Counseling offers career, personal and educational counseling and maintains a resource center containing job listings. The Office contacts potential employers to acquaint them with programs at the School and to request information about job openings. Current positions (permanent, summer, and part-time) are posted. Students are assisted in writing resumes, arranging for interviews, and exploring career opportunities. The Office's activities complement the efforts of departments, programs, and faculty advisers. Data collected about positions and salaries of graduates are available to prospective students.

Further information can be obtained from the Associate Dean of Student Affairs, Harvard School of Public Health, Room G-4, 677 Huntington Avenue, Boston, Massachusetts 02115.

Student Disciplinary Procedures

Incidents of improper conduct by a student shall be reported at once to the Associate Dean for Student Affairs. After investigation, the Associate Dean will either resolve the issue informally, in consultation with the parties involved, or refer the matter to the Administrative Board.

The Administrative Board, after receiving a formal charge and report from the Associate Dean, will convene to consider the case. They may call witnesses and review all evidence they deem relevant. The student involved may provide witnesses and other relevant evidence. The student may be present during the presentation of all evidence against her or him.

The Administrative Board must render a decision within a reasonable period of time, and may impose penalties ranging from Suspension to Probation. Expulsion requires a vote by the full faculty. The Board's actions shall be separate from the responsibility of instructors to evaluate the academic performance of students.

Following the Administrative Board's decision, the student may appeal to the Dean of the Faculty for a review of the procedure. The Dean may reverse the decision only if there has been unfairness in the procedure, or misconduct by the Board. The Dean will not reconsider the appropriateness of the finding or the penalty.

Student Conduct

Students are expected to respect the rights of the other members of the Harvard School of Public Health community and to maintain high standards of ethical conduct and personal integrity. A student is expected to do her or his own work, and incidents of intellectual dishonesty will result in disciplinary action. A student may not submit the same paper in more than one course without the prior written permission of the instructors involved.

Students are expected to abide by all city, state and federal laws, as well as University regulations, and infractions of the same may result in disciplinary action by the School.

Protection of Rights and Privacy of Students

The School of Public Health has adopted policies and procedures in compliance with The Family Education Rights and Privacy Act of 1974, which is commonly referred to as "the Buckley Amendment." Copies may be obtained from the Registrar's Office, Room G-4, 677 Huntington Avenue.

The Buckley Amendment was designed to protect the privacy of student educational records, afford students and former students the right to inspect the records that directly concern them, and provide students and former students the right to question and challenge the content of their educational records through formal hearings.

General records are compiled by the Admissions Office. These include materials furnished by the student, such as application forms and personal

statements, references, transcripts, and other materials from third parties. These files are not available to students until they register at the School. Once a student registers, these folders are transferred to the Registrar's Office, where they are held until after the student graduates. Copies of any correspondence with the student are added to these folders. In addition, if a student applies for financial aid, separate records of these transactions are kept in the Financial Aid Office.

Those at the School who have access to student records are the student's academic advisor, the student's department or program head, departmental evaluation committees where appropriate, the Committee on Admissions and Degrees, and the Dean's Office. Students may request to see their records any time after registration by going to the appropriate office and requesting an appointment to inspect the records. Students wishing to discuss or question their records may speak with the Associate Dean for Student Affairs. If a student wants to change or expunge something from the file, she/he should make a written request and file it with the Associate Dean for Student Affairs. A committee, comprised of the Associate Dean for Student Affairs, the Registrar and the Dean for Academic Affairs, will consider the request and make a decision as to the appropriate action. If the requested change is not granted, the student may place in the file her/his explanation and objection to the information in question.

If a student believes that the School has failed to comply with the provisions of this amendment, or of the implementing regulations, he or she may file a complaint with the Department of Education, Washington, D.C.

The following information is considered "Directory Information" and will be released on request without the student's specific written consent: Dates of attendance, program and field in which they are enrolled, full- or part-time status, degrees received, address and phone number (unless the student specifically asks at Registration that these not be released), date and place of birth, degrees received from other institutions, and name of academic advisor. Transcripts of academic work, or grades in any form, will not be released without the student's specific authorization, except to appropriate faculty advisors and committees with responsibility for students' academic progress. Outside organizations or institutions are never given access to student records but are permitted to interview the Registrar regarding the student's record upon presentation of signed consent forms. In such cases, every attempt is made to protect the privacy of the student and to prevent coercion by prospective employers.

Currently enrolled students who are applying for other programs at the School have the right to request that materials in their current student folder not be made available to the admissions committees considering applications.

Alumni Association

The School's Alumni Association has a membership of approximately 3,200 graduates located throughout the world. The Association is governed by an elected Council which meets twice a year, once in the fall at the APHA annual meeting, and once in the spring at the School. The Association publishes the *Alumni Bulletin* to inform members of activities at the School and to exchange news of classmates. In 1977 the Association began fund raising for the Margaret Dale Penrose Scholarship Fund to provide financial assistance to needy students. For information about alumni activities, contact the Associate Dean for Student and Alumni Affairs.

Looking over the agenda for the week of Orientation and Registration are new international students.

Courses of Instruction

In the course listings, course numbers from 100 to 199 indicate undergraduate and graduate courses; numbers from 200 to 299 indicate primarily graduate courses; and numbers from 300 to 399 indicate graduate courses of reading and research.

The letters "a," "b," "c," "d," and "e" following the course number indicate the period(s) in which a course is given, with "a" denoting first period and "b" second period (fall); "c" third period and "d" fourth period (spring). The letter "e" indicates supervised special studies or field observations, usually during the one-week period between fall and spring terms or during the post-class period following the spring term.

The credit assignment is given in units following the statement of number and length of sessions per week. Course titles in bold type are often followed by titles and numbers in roman face (enclosed in parentheses). This indicates that the course is also listed in other Harvard catalogs, namely, Arts and Sciences, and that the course credit is provided through that faculty as well as through the School of Public Health, e.g., **MCHA-BEH 237c,d** (Education, P-220), **POP 185a,b** (Sociology 185), **EHS 264c,d** (Engineering 283).

The School reserves the right to make changes in the regulations and courses announced in this *Register*.

Interdepartmental Courses

ID 201a,b. Historical Analysis of Public Health Policy and Practice: United States, 1900-1975
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Rosenkrantz.
Identifies six issues to illustrate the relationship between social experience and professional responsibility for prevention of disease. Topics selected for analysis based on historical example illustrate policy-related issues: how health hazards are identified; determinants of resources; criteria of efficacy and equity in policy and services. Recommended for students who wish to relate their special competence to the network of objectives in public health.

ID 209a,b. Health Services in Developing Countries
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Wray, Dr. Cash.
Provides a broad overview of health and health care problems in developing countries. Central issues include: ecologic, environmental, and other characteristics of developing countries affecting health; analysis of their health problems, the alternative approaches to solving them, the policy and planning issues in applying solutions, and the organizational alternatives for utilizing health resources; the nature, composition, and training of the health team for use at the local and district levels; and the relation of health to development and the position of health in national planning priorities. Preference given to students who have previously been involved in international health activities.

ID 212c. Biomedical Writing
Seminars. *One 2-hour session each week. 2 units.* Dr. Chernin.
Writing scientific papers is an integral part of the research process. This course develops practical skills and experience in planning and writing articles that meet the editorial demands of biomedical journals. The salient elements of a well-prepared article — logical organization, clear and concise scientific prose, and understandable tables and figures — are emphasized by criticizing short papers written by the participants on biomedical subjects of their own choice.
Enrollment limited to 10 students and requires advance approval of the instructor.

ID 215c,d. Environmental Health Evaluation and Management
Seminars, lectures. *Two 1½-hour sessions each week; additional computational sessions to be arranged. 5 units.* Dr. Harrington.
Introduces concepts and analytical methods for the quantitative evaluation and management of man's environment. Topics include: the development of natural resources, resulting environmental conditions, and effects on human health. Where appropriate, mathematical models are developed and critiqued in a systems analysis framework. Students are required to submit a term project.
A strong background in college-level mathematics is assumed.

ID 217c,d. Capitalism, Socialism, and Public Health
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Lewontin, Visiting Lecturers.
General course contrasting the analysis of problems in public health, nutrition, and population by Marxist and capitalistic social and economic theories. Topics include: Marxist economics and social theory, population control, "green revolution," nutrition planning, maternal and child health, and occupational health.

ID 220c,d. A Case Study in Integrated Planning
(Economics 2730, Education A-885, Planning 281)
Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. Cash, Dr. Noel McGinn (Lecturer in Education, Graduate School of Education), Dr. Michael Roemer (Lecturer in Economics, HIID), Dr. Donald Snodgrass (Lecturer in Economics, HIID), Dr. Brian Berry (Professor of City/Regional Planning, Graduate School of Design).
This seminar brings together students and faculty from the Graduate Schools of Public Health, Design, Education, Arts and Sciences (Economics), and from the Harvard Institute for International Development, to write a development plan for a specific geopolitical area of a developing country. This development planning problem is derived from an ongoing HIID project and emphasizes an inter-disciplinary team approach to problem solving and planning.
Enrollment subject to approval of the instructor.

ID 221b. Case Studies in Decision Making in the Control of Infectious Diseases of Public Health Importance (formerly **MIC 201c,d**)
Lectures, team meetings. *One 1-hour and two 2-hour sessions each week. 2.5 units.* Dr. Nichols, Guest Lecturers.
Cases drawn from domestic and Third World sources are studied from the standpoint of decision makers in the control of infectious diseases of public health importance. Students in teams will propose solutions to problems after utilizing information drawn from a spectrum of sources including: molecular biology, host-parasite interactions, epidemiology, management of resource allocations, cultural and socioeconomical constraints.
Enrollment limited to 60 and subject to approval of the instructor. No auditors.

ID 223c. Integrated Case Studies in Public Health
Lectures, discussions. *Two 2-hour sessions each week and small group discussions to be arranged. 2.5 units.* Dr. Stason.
Selected important health policy/public health problems are examined in the case format from a multidisciplinary point of view. The course will stress the contributions and the interdependence of the basic and clinical sciences, the quantitative sciences — epidemiology, biostatistics, economics, and decision analysis — and the social sciences in the analysis of such problems.
Prereq. Background in biostatistics, economics, epidemiology, and decision analysis recommended. No auditors.

ID 225d. A Case Study in Urban and Industrial Health Planning in a Developing Country (formerly **MIC 201c,d**)
Lectures, small seminars, workshops. *One 1-hour and two 2-hour sessions each week. 2.5 units.* Dr. Nichols.
Curative and preventive medicine requirements for a large industrial project and surrounding city are studied together with essential public health support services. Planning is not general but in detail including: definition of the problem; description of health hazards and load on the health services; alternate solutions; enabling and functional linkages required; functional programming including proximity matrices, facilities, staffing, operational support, management and administration requirements, costing and implementation.
Enrollment limited to 60 and subject to approval of the instructor. No auditors.

Behavioral Sciences

POP-BEH 130a,b. The American Household in Demographic Perspective
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Masnick.
(Course described under Population Sciences.)

BEH 201b. Health and Behavior
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
Considers the reciprocal relationship between health and behavior. Reviews attitudinal and sociodemographic factors in preventive health activities and disease.

BEH 202b. Sociological Perspectives in the Study of Health Attitudes and Behaviors (formerly **BEH 207b**)
Not given 1980-81.
Lectures, seminars. *Two 1½-hour sessions each week. 2.5 units.* Members of the Department.
Examines the sociological literature on consumer attitudes, sick-role behavior, prevention, and illness. Also considers methodological issues specific to this substantive area.
Prereq. Introductory sociology or equivalent, or permission of the instructor.

BEH 211a. Health Promotion
Seminars. *One 3-hour session each week. 2.5 units.* Dr. McAlister, Dr. Hamburg, Dr. Brown.
Discusses the way behavioral and environmental phenomena influence one another and interact to threaten health. Introduces relevant theories on the development and change of individual and group behavior. Outlines educational and organizational strategies for influencing social and environmental change. Case studies provide illustrations of health promotion in a variety of public health problem areas.

BEH 212b. Change of Health Behaviors (formerly **BEH 216b**)
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. McAlister.
Designed to provide students with practical research experience in health promotion. Content includes theories of behavior change and communication, as well as analysis of specific programs. Each student is assigned to a specific problem area for discussion and field work.
Prereq. Previous course work in social/behavioral sciences or relevant experience, and permission of the instructor.

BEH 213c. Behavioral Analysis
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Dr. Benfari.
Focuses on the psychological processes affecting performance and change in individual behavior, such as roles and expectations, perception, motivation, communications, stress, and life cycle changes. The learning model is based upon an experimental approach using cases, simulations, and personal involvement.

BEH 214d. Implementation of Intervention Programs
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Dr. Benfari.
Focuses on the planning, implementation, and evaluation of intervention programs addressing the primary prevention of disease. Examines risk factor reduction and life style changes in promoting health.

BEH 215d. Inducing Social Change (formerly **BEH 210d**)
Seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Mertens.
Designed for various specialists in public health who are charged with responsibility for introducing changes in organizations and communities. The subject matter includes methods and theories of teaching, principles of individual and group psychotherapy, approaches to sensitivity training and group dynamics, and organizational theory. Techniques and procedures illustrating these theories are presented through readings, discussions, and case illustrations.

BEH 220a,b. Psychiatric Epidemiology: Problems, Concepts, and Methods (formerly **BEH 204c, 204d**)
Seminars. *One 3-hour session each week. 5 units.* Dr. Wechsler.
Surveys the field of psychiatric epidemiology covering studies using data from psychiatric treatment services and institutions as well as field surveys of mental health in general populations. Topics include alcoholism and drug addiction, behavioral disorders, as well as major psychoses.

BEH 221d. Psychiatric Problems in Organizations and Industry (formerly **BEH 211d**)
Lectures, readings, case illustrations. *One 2-hour session each week. 2.5 units.* Dr. Mertens.
Designed to provide basic information relevant to clinical and case management in industrial and other organizational settings. It analyzes research and clinical findings in such a way as to prepare students to handle not only individual maladaptation, but also disintegration at the organizational level. It presents successively etiology and symptomatology of individual and group dysfunction and is designed for students who already have a basic knowledge of psychopathology.
Enrollment subject to approval of the instructor.

BEH 222c,d. Drug Addiction (formerly **BEH 208c,d**)
Seminars, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. McAuliffe.
Covers epidemiology, diffusion of drug use among peer groups, public policy, strategies of treatment and prevention, drug effects on health, program planning and administration, deviant careers of addicts, social control, and community responses to sociomedical problems.

BEH 230a,b. Methods of Social Research: Design and Measurement (formerly **BEH 215a,b**)
Seminars. *Two 1½-hour sessions each week. 5 units.* Dr. McAuliffe.
Social research methods, including participant observation, social experiments, and surveys, are examined with respect to design and measurement. Topics discussed at an advanced level appropriate for doctoral students.
Prereq. Previous or concurrent enrollment in BIO 101a,b.

BEH 231c,d. Methods of Social Research: Data Collection and Analysis (formerly **BEH 215c,d**)
Seminars. *Two 1½-hour sessions each week. 5 units.* Dr. Gortmaker, Dr. Walker.
Topics include: sampling, data collection techniques, construction of questionnaires, interviewing, costs of data collection, computer processing of large data files, and selected topics in the analysis of behavioral science data.
Prereq. BEH 230a,b, or permission of the instructor.

MCHA-BEH 237c,d. Child Development and Social Policy (Education P-220)
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Walker.
(Course described under Maternal and Child Health and Aging.)

BEH 300a,b,c,d,e. Tutorial Programs
Time and credit to be arranged. Staff of the Department.
Arrangements may be made with individual instructors to give a reading course on topics not covered in the Department's course offerings.

BEH 350. Research Training
Training in research is available through individual arrangements with the staff of the Department.

Biostatistics

BIO 101a,b. Principles of Biostatistics
Lectures. *Two 1-hour sessions each week.*
Laboratory. *One 3-hour session each week. 5 units.* Dr. Drolette.
Lectures and laboratory exercises acquaint the student with the basic concepts of biostatistics, their application and interpretation. Topics include: descriptive statistics, probability distributions, inference, tests of significance, association, and regression. Laboratory groups will be organized by areas of academic interest or specialization.

BIO 111c,d. Biostatistics for Medical Investigators
Lectures. *One 1-hour session each week. 1 unit.* Dr. Zelen.
Topics include: role of randomization, replication, and local control; planning of scientific experiments, therapeutic investigations and prognostic factors; concept of a population, mean, and variance; confidence procedures for one and two population problems; analysis of proportions; survival data, life tables, and maximum likelihood estimates.

BIO 202c,d. Statistical Methods in Research
Lectures, discussions, laboratory. *Sessions to be arranged. 5 units.* Dr. Reed, Dr. Ware, Dr. Feldman.
A continuation of BIO 101a,b; introduces the student to technical statistical procedures important in problems of laboratory and field research. Topics include: multiple regression, analysis of variance, analysis of categorical data and discriminant analysis. Much emphasis is placed on the analysis of data using Minitab.
Prereq. Basic preparation in statistics.

BIO 205c,d. Mathematical Foundations of Biostatistics
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Drolette.
Material includes: mathematical descriptions of commonly used distributions; standard procedures for estimating the moments of a distribution; and mathematical foundations of statistical inference, including the Neyman-Pearson lemma, the likelihood ratio, the central limit theorem, power and Bayesian inference.
Prereq. A course in elementary calculus.

BIO 207c,d. Survey Research Methods in Community Health
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Members of the Department.
Research design, sample selection, questionnaire construction, interviewing techniques, the reduction and interpretation of data, and related facets of population survey investigations are covered. Focuses primarily on the application of survey methods to problems of health program planning and evaluation. Treatment of methodology is sufficiently broad to be suitable for students who are concerned with epidemiological, nutritional, or other types of survey research.

BIO 210a,b. Advanced Topics in Biostatistics
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Waternaux, Dr. Thibodeau, Dr. Laird.
Offered primarily for doctoral students majoring in biostatistics or epidemiology, though other qualified students are welcome. Presents some recently developed data analytic techniques. Topics will be selected from among: robust estimation, applied multivariate methods, jackknifing, optimal design, cross-validation, predictive inference, fitting nonlinear models, empirical Bayes method, and incomplete data analysis.
This course may be combined with the Tutorial 310a,b.
Prereq. Permission of the instructor is required of students not majoring in biostatistics or epidemiology.

BIO 211c,d. Discrete Multivariate Analysis
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Louis.
Deals with the use of log linear and other models to describe multivariate data with discrete components. Emphasizes practical application rather than mathematical theory. Topics include the analysis of contingency tables, measures of association, standardization of rates, logistic regression, ordinal data, and variance components for discrete data. Methods of estimation, hypothesis testing, and assessment of model adequacy are studied.
Prereq. A statistics course which includes analysis of variance.

BIO-HPM 212a. Forecasting and Its Use in Health Programs and Institutions (formerly **BIO-HPM 206d.**)
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Reed, Members of the Departments of Biostatistics and Health Policy and Management.
A conceptually sophisticated, but mathematically basic, examination of the purposes, methods and data inputs for forecasting in health-related fields. Time series, transfer functions, simulation, and Delphic methods discussed along with their theoretical and empirical forecasting errors. All concepts are grounded in detailed case studies.
Prereq. BIOa,b or HPM-BIO 219b,c,d; or those familiar with regression methods may enroll with permission or the instructor.

BIO 213b. Computing Principles and Methods
Lectures, discussions. *Two 1-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 2.5 units.* Dr. Neff, Members of the Health Sciences Computing Facility.
Among the principles and methods of computing and data processing included in the course are: programming, flow-charting, and the use of a statistical program package, a data base management system, and computer program libraries. Criteria for choosing among existing programs are delineated. Case studies used to illustrate methods of data collection, coding, and data reduction.

BIO 214c. Principles of Clinical Trials
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Gelber, Dr. Stanley.
Designed for individuals interested in the scientific, policy and management aspects of clinical trials. Topics include: types of clinical research, study design, treatment allocation, randomization and stratification, data management and quality control, sample size requirements, patient consent and interpretation of results. Students will design a clinical investigation in their own field of interest and will critique recently published investigations.
Prereq. Previous or concurrent enrollment in an introductory statistics course.

BIO-HPM 215c, 215d. Health Program Evaluation
Lectures, discussions. *One 2-hour session each week. 1.25 units each period.* Dr. Reed.
Designed to increase a student's ability to understand the uses and limitations of methods employed to evaluate health programs. The "c" period concentrates on a review of various methodologies and the "d" period focuses on their application.

HPM-BIO 216c. Analysis of Health and Medical Practices (Public Policy S-176m)
Lectures, discussions. *Two 1½-hour sessions each week. 2.5 units.* Dr. Milton C. Weinstein (Professor of Public Policy, John F. Kennedy School of Government).
(Course described under Health Policy and Management.)

BIO 217a,b. Probability Theory and Applications
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Waternaux.
A course in probability theory fundamental to the statistics program. Topics include: algebra of events, axiomatic foundations combinatorial probability, discrete and continuous sample spaces, lebesque integration, conditional probability and independence, random variables, generating functions and characteristic functions, standard distributions, expectation and variance operators, limit theorems, Poisson processes, and applications in health-reated areas.
Prereq. Intermediate calculus (one or two semesters beyond elementary calculus).

BIO 218c,d. Statistical Inference
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Louis.
A fundamental course in statistical inference. Topics include: methods of estimation, least squares, maximum likelihood, Bayesian methods, properties of estimates, confidence procedures, significance testing, likelihood ratio tests, goodness of fit tests, Neyman-Pearson theory, sufficiency, power and optimality, sequential analysis, non-parametric inference, and decision theory. The theory will be illustrated with examples from health-related research.
Prereq. BIO 217a,b or equivalent.

HPM-BIO 219b,c,d. Statistical Methods for Health Policy and Management (formerly **HPM-BIO 206a,b,c**)
Lectures. *Two 1½-hour sessions each week. 7.5 units.* Dr. Thibodeau, Dr. Mehta.
(Course described under Health Policy and Management.)

BIO 220c,d. Multivariate Analysis for Quantitative Data
Lectures, student presentations. *Two 1½-hour sessions each week. 5 units.* Dr. Waternaux.
Topics include: Hotelling's T^2, principal component and factor analysis, discriminant functions, clustering, and canonical correlation, with some discussion of distribution theory and tests of hypotheses. Students will participate in the analysis of a data set.
Prereq. At least one statistics course beyond the level of BIO 101a,b, knowledge of matrices, and some familiarity with computer packages such as SPSS, BMD, or SAS.

BIO 240c,d. Design of Experiments (Statistics 140)
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Zelen.
Given alternate years; 1981-82.
Examines general principles and practical difficulties in controlled experimentation. Topics include: introduction to randomization theory, methods for increasing precision, principal types of designs, mixed and random effects models, and variance component estimation. Intended for students with a primary interest in statistics and biostatistics.
Prereq. One or more courses covering the basic concepts of distributions, expectations, samples, testing, estimation, regression, and analysis of variance.

BIO 251a,b. Data Analysis
Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Schoenfeld, Dr. Gelber, Dr. MacIntyre.
Teaches the statistical techniques necessary for analyzing data from clinical and biological studies. Major topics include: analysis of normally-distributed data, analysis using distribution-free methods, discrete data analysis, survival analysis, and analysis of data models. Multiple regression and the logistic, loglinear and Cox models are covered in the data models section. The concepts underlying statistical techniques are stressed rather than numerical calculation or mathematical derivation. The course is designed for students in the Health Sciences who will use statistical techniques but do not have the background to take BIO 261.
Prereq. A course in statistics or permission of the instructor.

BIO 261a,b. Theory of Biometry I
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Feldstein.
Discusses the theoretical basis of concepts and methodologies associated with bioassay, life tables, the general theory of survival distributions and censoring, competing risk models, and the planning of clinical trials. Material is drawn from recent literature.
Prereq. Statistics 111 or equivalent, or permission of the instructor.

BIO 262c,d. Theory of Biometry II
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Members of the Department.
A continuation of BIO 261a,b. Topics include: semi-Markov processes as models for disease processes; generalizations of the stable disease model, such as incidence, prevalence, and time in state; models of early disease detection; length-biased sampling; optimization and periodic screening; and cell kinetics and labeling techniques.
Prereq. BIO 261a,b.

BIO 263a,b. Regression and Analysis of Variance
Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Begg.
Examines the methods of least squares and maximum likelihood as applied to linear statistical models: multivariate regression, calibration, analysis of variance, and random effects models. Topics include the development of hypothesis testing, confidence intervals and Bayesian techniques. Exercises and examples emphasize medical applications.
Prereq. A course in statistics at the level of Statistics 110; familiarity with matrix algebra.

BIO 266c,d. Stochastic Processes in Medicine and Biology
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Lagakos.
Given alternate years; 1980-81.
Discusses those areas of modern applied probability useful for model building in the biomedical sciences. Topics include: Poisson processes, birth and death processes, Markov

chains and processes, renewal theory, compartment models, random walks and sequential analysis, and the theory of epidemics. Examples are drawn from the biomedical sciences.
Prereq. Statistics 111 or equivalent, or permission of the instructor.

BIO 271. Computer Programming
Lectures. *Two 2-hour sessions each week for the first two weeks of the "a" period.*
Laboratory. *10 hours each week for the first two weeks of the "a" period.* No credit is given for this course. Dr. Neff, members of the Health Sciences Computing Facility.
An intensive, non-credit short course in computer programming in the FORTRAN language. Students without previous exposure to this language develop a working proficiency in it. Provides minimal skills in computer programming necessary to enter subsequent computing courses in the biostatistics curriculum.

BIO 273a,b. Introduction to Computing
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 2-hour session each week. 5 units.* Dr. Neff.
Introduces the fundamentals of computing, emphasizing algorithms, information flow, and the systematic design of programs in higher-level languages such as FORTRAN. Topics include: the structure of digital computers, programming languages, algorithm development and usage, systems of analysis, and systematic design of programs and computing systems.
Prereq. Previous programming experience, or concurrent enrollment in BIO 271.

BIO 274c,d. Statistical Computing
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 5 units.* Dr. Pagano.
Enables students to understand, properly use, and possibly develop statistical algorithms or software. Topics are prompted by statistical procedures or biomedical applications, and include: computer arithmetic, error analysis, numerical techniques, equation solving, matrix operations, approximation and smoothing, optimization, and simulation modeling.
Prereq. BIO 273a,b or equivalent, or permission of the instructor.

BIO 275a,b. Applied Data Management
Lectures, demonstrations. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 5 units.* Members of the Department.
Not given 1980-81.
Introduces management of data, both external and internal, to computer data bases, concepts and techniques for handling data before it is ready for analysis, and practical aspects of computer data base design and usage. Topics include: data collection, forms and coding, data entry systems, quality control, data base structures (both logical and physical), data base management systems, file organization, and data models.
Prereq. BIO 273a,b or equivalent, or permission of the instructor.

BIO 310-315a,b,c,d. Tutorial Programs
Time and credit to be arranged. Staff of the Department.
An opportunity for tutorial work is offered for interested and qualified students or small groups of students. Arrangements must be made with individual faculty members and are limited by the amount of faculty time available. These programs are open to students specializing in biostatistics and also to students in other fields who wish to go beyond the content of the regular courses. Six broad categories of this tutorial instruction are identified by the six course numbers below.

310 *Statistical Methods*
Guided study in specific areas of statistical methodology and application.

311 *Teaching*
Work with the Department in laboratory instruction and the development of teaching materials.

312 *Consultation*
Work with members of the Department on current statistical consultation activities.

313 *Computing*
Guided study in scientific programming, numerical methods, and data management.

314 *Study Design*
Guidance in developing statistical design of a study in which the student has a particular interest.

315 *Data Analysis*
Guidance in the statistical analysis of a body of data in which the student is interested.

Students may register for BIO 310-315 for a maximum of five credit units in the summer term.

BIO 350. Research
Candidates for the Doctor of Public Health, Doctor of Science, or other doctoral degrees may arrange for individual research. The work may be part of the program for a doctorate in this Department or may be integrated with doctoral research in other departments.

Attention is directed to EPI 202b, 203c, 204d, and 205c,d, courses of interest to biostatistics students, descriptions of which are found under Epidemiology.

Environmental Health Interdepartmental Courses

The following courses are conducted by the faculty and staff of the Kresge Center for Environmental Health, which includes the Departments of Environmental Health Sciences, Physiology, Sanitary Engineering, and the Occupational Health Program.

EHI 201a, 201b/201c, 201d. Principles of Environmental Health
Lectures. *Two 1-hour and one 2-hour sessions each week. 5 units.* Dr. Moeller.
Reviews the more important environmental health problems facing society. Topics in the "a" period include: radiation protection, air pollution control, occupational health, and environmental physiology and toxicology. Topics in the "b" period include: basic sanitation, water purification, waste-water treatment, traumatic injuries, environmental law and economics, and the health implications of energy use. A term paper is required.
Note: The course is repeated in the spring semester.
Required for students in the M.P.H Program and recommended for students in the Department of Environmental Health Sciences (b or d sessions only).

EHI 204a,b. Human Factors in Occupational Performance and Safety
Lectures, demonstrations. *One 2-hour session each week. 2 units.* Dr. Snook.
Emphasizes the design of the job to fit the worker. Specific problems are investigated which result from the nature of the job itself, e.g., low back injuries, fatigue, hand disorders, slips and falls, human error, and psychological stress. The physiological, psychological, and anatomical characteristics of the worker are considered in the development of good job design principles.

EHI 205a,b. Current Topics in Occupational Health and Safety
Seminars. *One 1-hour session each week. 1 unit.* Dr. Peters, Staff of the Kresge Center, Visiting Lecturers.
Weekly seminars presented by faculty or guests involved with occupational health and safety problems. The purpose is to introduce students concentrating in occupational safety and health (including industrial hygiene) to the field. The seminars cover technical as well as policy issues.
This course will be given pass/fail.

EHI 206a,b. Occupational Medical Clinics
Lectures, clinics. *One 2-hour session each week. 2 units.* Dr. Murphy.
Not given 1980-81.
Reviews the diagnostic techniques used by clinicians to detect and screen for a variety of occupational diseases, such as silicosis, contact dermatitis, and lead poisoning. The clinical syndromes of common occupational diseases are considered. The clinics are limited to physicians.
Enrollment subject to approval of the instructor.

EHI 207a,b. Policy Issues in Occupational Health
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Boden.
Examines the legal, economic, and political foundations of occupational health activities in the United States. Enables students to develop the knowledge and skills in the above areas necessary to apply medical, industrial hygiene, and statistical skills to achieve a healthful workplace. The roles of government, unions, corporations, and research organizations are discussed.

EHI 209c,d. Mathematical Modeling for Health Sciences
Lectures, discussions. *Three 1-hour sessions each week, "c" period; two 2-hour sessions each week, "d" period. 4 units.* Dr. Butler.
A range of models for the space and time dependence of the key variables in natural systems is discussed. Specific applications emphasize processes that characterize the response of the organism to its environment. The inverse problem of using measurements to infer estimates of parameters of models is developed.
Prereq. Calculus, PHY 203a,b, and statistics to the level of concurrent enrollment in BIO 202c,d, 205c,d, or 210a,b.

EHI 211a,b. Critical Review of the Scientific Basis for Occupational Standards
Seminars. *One 2-hour and one 1-hour session each week. 5 units.* Dr. Wegman, Dr. Peters.
Designed to provide students with the opportunity to review the scientific basis for the association of selected occupational exposures with disease. Special emphasis is placed on critical evaluations of the literature. Reviews occupational cancer and respiratory disease, pathophysiology of respiratory disease and epidemiologic approaches to chemical carcinogenesis. Attention will be directed specifically to the interface of science and regulatory standards.
Enrollment limited to 15.
Prereq. EPI 201a, BIO 101a,b, EHI 251c,d, or permission of the instructors.

EHI 213a,b. Occupational Safety Science
Lectures, discussions. *Two 1-hour sessions each week. 2.5 units.* Dr. Keyserling.
Covers the fundamental principles of occupational safety science. Topics include: theoretical models of accident causation, accident investigation procedures, systems analysis, safety standards, safety performance measurement, and product safety. Emphasizes the use of engineering controls and administrative practices to alleviate workplace hazards.

EHI 251c,d. Basic Problems in Occupational Health and Industrial Environments
(Engineering 282)
Lectures. *Two 2-hour sessions each week.*
Laboratory demonstrations, field trips. *One 3-hour session each week. 5 units.* Dr. Ferris, Dr. Peters, Mr. Burgess, Dr. Smith, Dr. Wegman.
Lectures, laboratory demonstrations, and inspections of workplaces show the relation of working conditions to health, with special reference to the recognition, measurement, and control of hazards. Examples include adverse conditions of temperature, humidity, radiation, and chemical and physical irritants. Particular emphasis is given to the prevention, diagnosis, and treatment of industrial disability and disease, and to workmen's compensation.
Prereq. PHY 203a,b.

EHI 254b. Introduction to Industrial Hygiene
Lectures, seminars, laboratories. *One 2-hour session each week. 1.25 units.* Dr. Smith.
Intended for physicians, nurses, and other health professionals who will work with industrial hygienists in a variety of settings. Designed to familiarize these professionals with the methods used by the industrial hygienist in the prevention of occupational disease, thereby promoting a more effective working relationship. Topics include: the physical form of air contaminants, air sampling and analysis, engineering controls, and the preparation of survey protocols.

EHI 330e. Field Work
One-week period between fall and spring terms. 1 unit.
A week of supervised field observation is offered to students who may choose appropriate visits to medical or industrial hygiene departments of industries, airports, and other agencies which have operations or research in the field of environmental health. Field work arrangements are generally made early in the fall term.

Environmental Health Sciences

EHS 202a,b. Departmental Seminars
Seminars. *One 1-hour session each week. 1 unit.* Dr. Cooper.
Members of the Department present for discussion aspects of their current research in the "a" period; speakers from outside the Department present topics relating to the environment in the "b" period.

EHS 202c. Departmental Seminars
Seminars. *One 2-hour session each week. 1 unit.* Dr. Spengler.
In the "c" period, second-year master and doctoral students report on their research in progress.

EHS 211a, 211b. Introduction to Environmental and Health Management
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Cooper.
Emphasizes quantitative and descriptive methods for decision making in environmental and health management. The "a" period serves to introduce operations research: planning, forecasting, optimization, and control. The second period emphasizes modeling: rate processes, decision theory, large-scale environmental models.

EHS 252c. Environmental Control: Industrial Ventilation (Engineering 280)
Lectures. *Two 1-hour sessions each week.*
Laboratory. *One 3-hour session each week. 2.5 units.* Mr. Burgess.
Intended for industrial hygiene and air pollution students. Covers the design and evaluation of local exhaust ventilation systems for the control of toxic air contaminants released into the workplace by industrial operations and processes.

EHS 252d. Noise and Vibration Control (Engineering 280)
Lectures. *Two 1-hour sessions each week.*
Laboratory. *Four 3-hour sessions. 2.5 units.* Dr. Cudworth, Mr. Cavanaugh (Consultant in Acoustics).
Introduces the fundamentals of sound and vibration generation, transmission, and reception. Emphasizes the control of environmental noise hazards in industrial workplaces. Basic measurement instrumentation and techniques will be introduced with practical exercises. Noise hazard control methodology will be explored by means of lectures, demonstrations, and field trips to laboratories and industrial plants.

EHS 253a,b. Aerosol Technology (Engineering 286)
Lectures. *Two 1-hour sessions each week.*
Laboratory. *One 2-hour session each week, "a" period; one 4-hour session each week, "b" period. 5 units.* Dr. Hinds.
Covers the properties of suspended particulate matter (dust, smoke, clouds) and the physical principles underlying its behavior. Topics include: particle motion due to gravitational, thermal, and electrostatic forces; diffusion; impaction; coagulation; filtration; condensation and evaporation; optical properties; and sizing statistics. Laboratories cover optical and electron microscopy, sampling, and mass concentration and particle size measurement.
Required for concentrators in industrial hygiene and air pollution control.

EHS 255a. Health Hazards of Manufacturing Processes
Lectures, field trips. *One 2-hour and one 3-hour session each week. 2.5 units.* Mr. Burgess, Members of the Department.
Deals with the recognition of health hazards in the workplace using a unit operations approach to manufacturing processes. Designed as an introduction to other courses which consider the evaluation and control of hazardous conditions in the workplace.
Enrollment limited to 30 and subject to approval of the instructor. Preference given to students in the Department of Environmental Health Sciences and the Occupational Health Program.

EHS 261a,b. Community Air Pollution (Engineering 284)
Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. First, Dr. Leith.
Measurement and control of community air pollution; pollutant dispersion; air quality standards; health effects; damage to animals, plants, and property; community and site surveys; the legal and enforcement aspects of air pollution control; the nature and quantity of atmospheric emissions from vehicles, incinerators, and specific industries.
Prereq. A working knowledge of chemistry.

EHS 262c. Meteorological Aspects of Air Pollution (Engineering 285)
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Spengler.
Provides the student with a general understanding of the present status of local and long-range dispersion modeling. Also presents an evaluation of the meteorological factors associated with the transport, transformation, dispersion, and removal of air pollutants. Students will learn to recognize and define the parameters of elements in the atmosphere affecting pollutant dispersion and to calculate concentration fields downwind of pollutant sources.
Prereq. Knowledge of calculus.

EHS 264c,d. Identification and Measurement of Air Contaminants (Engineering 283)
Lectures. *Two 1-hour sessions each week.*
Laboratory. *One 3-hour session each week. 5 units.* Dr. Smith, Staff of the Department.
Emphasizes sampling and analytical methods for air contaminants plus related subjects. Included are: chemical and instrumental methods of air analysis, isokinetic sampling, biological and solvent analysis, radioactive aerosol determinations, air pollution surveys, and fire and explosion evaluations.
Required for concentrators in industrial hygiene and air pollution control and for students in the radiological health and the Master of Industrial Health programs.

EHS 265c,d. Air and Gas Cleaning (Engineering 289)
Lectures. *One 2-hour session each week.*
Laboratory. *One 2-hour session each week. 5 units.* Dr. Leith, Dr. First, Staff of the Department.
Covers theory, selection, application, and testing of air and gas cleaning devices, including: particle collection by inertial and centrifugal force, gas absorption in liquids and adsorption on solids, gas incineration, and basic processes of particle conditioning. Laboratory experiments and case studies illustrate important aspects of sizing and correct selection of equipment.
Prereq. EHS 253a,b and previous or concurrent enrollment in EHS 264c,d.

HPM-EHS 267a,b. Political Economy of Environmental Health Regulations
Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Roberts.
(Course described under Health Policy and Management.)

HPM-EHS 269c,d. Environmental Health Policy Analysis
Lectures, case discussions. *Two 2-hour sessions each week. 5 units.* Dr. Roberts, Dr. Cooper.
(Course described under Health Policy and Management.)

EHS 271a,b. Introduction to Radiation Protection (Engineering 288)
Lectures, demonstrations. *One 2-hour and one 1-hour session each week. 5 units.* Dr. Shapiro, Dr. Moeller.
Covers laboratory, industrial, and environmental sources of radiation; the interaction of ionizing particles with matter; the concept of radiation dose from external and internal sources; radiation measurements; radiation protection standards and regulations; and methods of environmental and occupational radiation protection. (Students desiring laboratory experience in the use of radiation measuring instruments should enroll concurrently in EHS 272b.)

EHS 272b. Introduction to Radiation Instrumentation
Laboratory. *One 2-hour session each week. 1.25 units.* Dr. Shapiro.
Provides an introduction to the use of radiation measuring equipment and supplements the material presented in EHS 271a,b. Exercises cover radiation counting, gamma spectroscopy, and the use and calibration of radiation survey instruments. (This course is available to students in EHS 271a,b who desire laboratory experience in the use of radiation measuring instruments.)
Enrollment limited and subject to approval of the instructor.
Prereq. Previous or concurrent enrollment in EHS 271a,b.

EHS 273c,d. Advanced Topics in Radiation Protection
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Moeller, Dr. Shapiro.
Involves detailed study of current handbooks and publications related to radiation protection. Areas covered include the regulation of radiation use and the evaluation and control of radiation hazards. Specific topics include: regulatory guides and standards; radiation shielding with emphasis on neutrons; protection against internal emitters; and the control of radioactive contamination.
Prereq. EHS 271a,b and permission of the instructors.

EHS 274c. X-ray Protection
Lectures. *One 2-hour and one 1-hour session each week.*
Laboratory. *One 3-hour session each week. Time to be arranged. 2.5 units.* Dr. Webster.
Not given 1980-81.
Covers the fundamentals of X-ray equipment (both industrial and medical), the design of X-ray installations, and the procedures for radiation protection surveys and inspections, and includes several problem assignments. Considerations include: equipment and room design, with emphasis on items such as leakage; collimation; filtration; primary and secondary barriers; workload; and protection of patients.
Prereq. EHS 271a,b.

EHS 281a. Introduction to Physics of Diagnostic Radiology
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Philip Judy.
Given alternate years; 1981-82.
For students in medical physics and radiological health. Covers the fundamentals of diagnostic radiology, including diagnostic criteria, such as abnormal size, position, motion, or structure; principles of specific studies, e.g., cardiac angiography; and the use of contrast media. Reviews principles of equipment employed, such as diagnostic X-ray sources, recording systems, film, screens and image intensifiers, and factors affecting image quality and patient exposure.

EHS 282b. Introduction to Physics of Nuclear Medicine
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Bjarngard, Mr. Zimmerman.
Given alternate years; 1981-82.
Production and properties of radionuclides and radiopharmaceuticals, as well as the physiological basis for medical applications, form the foundation for this course for students in medical physics and radiological health. Principles of specific studies are presented (e.g., uptake measurements, tracer kinetics, static and dynamic imaging and *in vitro* techniques). Instrumentation and factors affecting accuracy, image quality, and patient exposure are also discussed.
Note: Mr. Zimmerman is the principal instructor for this course.

EHS 283a. Introduction to Physics of Radiation Therapy
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Svensson (Associate Professor of Radiation Therapy, Harvard Medical School).
Given alternate years; 1980-81.
For students in medical physics, reviews tumors of different primary sites and their histology and routes of spread. Various aspects of radiation therapy are discussed, including time-dose relationships, influence of oxygen and chemical agents, tumor localization, treatment planning, and simulation. Also covered are treatment with external beams, radioactive isotopes, implants and intercavitary sources; dose calculations; and machine specifications and designs.

EHS 284c,d. Physics of Diagnostic Radiology
Lectures. *One 2-hour and one 1-hour session each week.*
Laboratory. *One 3-hour session each week. 5 units.* Dr. Webster.
Given alternate years; 1981-82.
Deals with the physical and mathematical aspects of image formation, including: characteristics of diagnostic X-ray machines and recording systems; geometrical relationships; X-ray spectra; information limits; optical physiology and performance; special techniques, such as magnification and cine radiography; and computerized tomography. Radiation protection also covered, with an emphasis on patient dose.

EHS 285a,b. Physics of Nuclear Medicine
Lectures. *One 2-hour session each week.*
Laboratory. *One 3-hour session each week. 5 units.* Dr. Bjarngard, Mr. Zimmerman.
Given alternate years; 1980-81.
Covers the physical and chemical aspects of production, properties, and standardization of radionuclides and radiopharmaceuticals, including cyclotron production of short-lived isotopes. Also discussed are instrumentation (e.g., scanners, cameras, proportional counters, the positron camera) and computer applications involving dynamic and regional function analysis, radionuclide tomography, and image processing. The measurement of calcium in bone is also covered.
Note: Mr. Zimmerman is principal instructor for this course.

EHS 286c, 286d. Physics of Radiation Therapy
Lectures. *One 2-hour session each week.*
Laboratory. *One 3-hour session each week. 2.5 units each period.* Dr. Bjarngard.
Given alternate years; 1980-81.
Deals with the mathematics of treatment planning for external beams, brachytherapy and radioactive nuclides, including computerized techniques. Also covered are accurate and precise dosimetry measurements for photons, electrons, protons, and neutrons, including calibration and quality control of machines and sources. Selected studies of current clinical problems are also presented.

EHS 301-306a,b,c,d,e. Tutorial Programs
Reading or research. *Time and credit to be arranged.*
Reading or research assignments for individual tutorial work at a master's degree level are provided for qualified students in the fields of industrial hygiene, industrial ventilation, aerosol technology, radiological health, medical radiation physics, nuclear medicine, solid waste management, air pollution control, and environmental health management.

301 *Air Pollution*
Dr. Cooper, Dr. First, Dr. Leith, Dr. Spengler.

302 *Industrial Hygiene*
Mr. Burgess, Dr. Hinds, Dr. Smith.

303 *Radiological Health*
Dr. Moeller, Dr. Shapiro.

304 *Medical Physics*
Dr. Bjarngard, Dr. Webster.

305 *Solid Wastes*
Dr. First.

306 *Environmental Health Management*
Dr. Cooper, Dr. Moeller.

Enrollment subject to approval of the Head of the Department.

EHS 350-360. Research
Facilities of the Department are available for doctoral candidates and properly qualified second-year master's degree students to pursue independent research on problems in industrial hygiene, aerosol technology, solid waste management, air pollution control, and radiological health. Areas currently receiving study in the Department are as follows:

351 Dr. Smith
Evaluation of performance factors of respiratory protective devices; monitoring exposures of occupational groups to toxic air contaminants; ventilation control of airborne contaminants; evaluation and control of noise.

352 Dr. First
Application of gas- and liquid-phase reactions to particulate and gas removal; development and design of cleanup systems for airborne contaminants from industrial and nuclear power plant facilities; incineration of solid wastes including municipal, radioactive, biological, and laboratory materials.

353 Dr. Leith
Measuring and modeling the performance of industrial gas cleaning equipment; assessing the air pollution potential of simple and complex pollution sources.

354 Dr. Spengler
Computer modeling of pollutant transport in urban atmospheres; analysis of air quality data derived from sampling networks; meteorology of urban areas.

355 Dr. Cooper
Experimental and theoretical research in aerosol generation, measurement, behavior, and control; quantitative methods of environmental management.

356 Dr. Moeller
Reduction of population dose from sources of natural origin; environmental protection for nuclear facilities; radiation safety criteria and standards.

357 Dr. Hinds
Sampling and analysis of aerosol particles both in the ambient atmosphere and under laboratory conditions; generation of monodisperse aerosols; uses of aerosols in environmental health; development of particulate removal equipment.

358 Dr. Shapiro
Evaluation and control of hazards from radioactive contamination; radiation dosimetry.

359 Dr. Bjarngard
Medical radiation physics with emphasis on dosimetry, nuclear medicine, and radiation therapy.

360 Dr. Webster
Medical radiation physics with emphasis on survey techniques, instrumentation, and image quality and patient dose reduction in diagnostic radiology.

361 Dr. Keyserling
Prevention of overt and cumulative occupational trauma; evaluation of jobs for biomechanical and physiological stresses; computer modelling of human strength; ergonomic applications to job design.

Enrollment subject to approval of the Head of the Department.

The following courses, offered in the Harvard Faculties of Arts and Sciences and Government, and at the Massachusetts Institute of Technology, are open to qualified students from the School of Public Health and may be of interest to students of environmental health sciences.

Economics 1010c. Microeconomic Theory
Half course *(fall term). M., W., F., at 11.* Ericson.
Prereq. Elementary calculus.

Economics 1011a. Microeconomic Theory and Policy Analysis
Half course *(spring term). M., W., F., at 11.* Kresge.

Economics 1551. The Political Economy of Environmental Quality
Half course *(spring term). Tu., Th., at 12.* Dorfman.
Prereq. Economics 10 or permission of instructor.

Natural Sciences 110. Automatic Computing
Half course *(fall term). M., W., F., at 10.* Bossert.

Natural Sciences 115. Models for Control of Man's Physical Environment
Half course *(fall term). M., W., F., at 9.* Harrington, Rogers.
Not given 1980-81.

Natural Sciences 134. Technological Assessment
Half course *(spring term). Tu., Th., at 10 and occasional discussion hours to be arranged.* Brooks.

Natural Sciences 145. Energy, the Environment, and Public Policy
Half course *(fall term). Tu., Th., 9:30-11.* Wilson.
Not given 1980-81.

M-111. Analysis for Decision Making
Half course *(spring term). M, W., 8:30-10. Ludo Van der Heyden.*

M-271. Law and Public Policy: Policy Analysis
To be given 1980-81. Hours to be announced. Roberts, Schelling.

S-482. Seminar: Science, Technology, and Public Policy
Half course *(spring term). M., 2-4.* Brooks, Cohen, Zinberg.

M.I.T. 1.143. Mathematical Optimization Techniques
Nine units *(spring term). Hours to be arranged.* D. H. Marks.

M.I.T. 1.146. Engineering Systems Analysis
Nine units *(fall term). Tu., Th., 10:30-12.* De-Neufville *et al.*

M.I.T. 1.811. Environmental Law: Pollution Control
Nine units *(fall term). Tu., Th., 4-5:30.* Ashford and Heaton.

M.I.T. 1.812J. Regulation of Health and the Environment: Selected Topics
Nine units *(spring term). Hours to be arranged.* Ashford and Heaton.

M.I.T. 14.121. Micreconomic Theory I
Six units *(fall term). M., W., 10:30-12 (first half term only).* Solow and Fisher.

M.I.T. 15.065. Decision Analysis
Nine units *(fall and spring terms). Tu., Th., 10:30-12.* Kaufman.

M.I.T. 15.081J. Introduction to Mathematical Programming
Twelve units *(fall and spring terms). Tu., Th., 2:30-4.* Magnanti and Mitter.

M.I.T. 22.37. Environmental Impact of Electric Power Production
Twelve units *(spring term).* Golay.

Epidemiology

EPI 201a. Introduction to Epidemiology
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Morrison, Dr. MacMahon.
Lectures are supplemented by readings and exercises to familiarize students with epidemiologic concepts, especially those pertinent to the understanding and control of the chronic diseases.

EPI 202b. Principles of Epidemiology I: Elements of Study Design and Data Analysis
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Rothman.
For students at the master's level who wish to acquire a familiarity with epidemiologic methods. The principles of study design and data analysis are presented with examples and exercises. The emphasis is on practical rather than theoretical issues. May serve as an introduction to more advanced study or as a final course for those desiring a working familiarity with epidemiologic methods.
Prereq. Knowledge of calculus and EPI 201a or permission of the instructor.

EPI 203c. Principles of Epidemiology II: Problem Conceptualization and Study Design
Lectures, seminars. *Two 2-hour sessions each week. 4 units.* Dr. Miettinen.
With a detailed text providing background, the course utilizes simple examples and other illustrations to introduce the objects of epidemiologic research and the goals, options, and decision principles in study design. (A parallel tutorial course is available for those desiring in-depth study.)
Prereq. EPI 202b or permission of the instructor.

EPI 204d. Principles of Epidemiology III: Data Analysis and Inference
Lectures, laboratory. *Two 2-hour sessions each week. 3 units.* Dr. Miettinen.
Again with a detailed text in the background, the course uses examples from actual studies to introduce the principles of hypothesis testing and estimation in epidemiologic research. (A parallel tutorial course is available for those desiring in-depth study.)
Prereq. BIO 101a,b, EPI 202b, or permission of the instructor.

EPI 205c,d. Practice of Epidemiology
Tutorials, seminars. *Tutorial sessions during "c" period; one 2-hour seminar each week during "d" period. 2.5 units.* Dr. Rothman.
The seminars consist of student presentations of plans for and analyses of epidemiologic data, with discussion by students and faculty. Preparatory work is done under tutorial arrangements with members of the faculty. For the analyses, the emphasis will be on conceptual issues and not on execution.
Prereq. EPI 202b and permission of the instructor.

EPI 206c,d. Topics in the Theory of Epidemiology
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Hutchison, Members of the Department.
For students who expect to conduct epidemiologic research. Consists of lectures on topics that are not part of the basic methodology covered in other courses in the Department. Topics include: sampling, factors affecting response, data handling, analysis of time-place clustering, cyclic variation, survival, and problems of distinguishing genetic and environmental components of a disease.
Prereq. EPI 201a and BIO 101a,b, or equivalent.

EPI 211b. Epidemiology of Chronic Disease: Psychiatric Diseases
Lectures. *One 2-hour session each week. 1.25 units each period.* Dr. Hutchison, Dr. Shapiro.
Basic principles of psychiatric epidemiology and the epidemiology of specific psychiatric disorders. Schizophrenia, affective disorders, and psychiatric disorders of childhood will receive particular attention.

EPI 211c. Epidemiology of Chronic Disease: Cancer and Screening
Lectures. *One 2-hour session each week. 1.25 units each period.* Dr. Morrison.
A review of the epidemiology of cancer of several sites, and of population screening for cancer. Radiation carcinogenesis, and the natural history of "premalignant lesions," also will receive attention.

EPI 211d. Epidemiology of Chronic Disease: Cardiovascular and Respiratory Disease
Lectures. *One 2-hour session each week. 1.25 units each period.* Dr. Hutchison.
A review of the epidemiology of the chronic cardiovascular and respiratory diseases. Demographic distribution and time trends of these diseases are presented, and known risk factors are discussed.

EPI 212c,d. Environmental Epidemiology
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Monson.
This course has three objectives: (1) to review methods used in evaluating the health effects of physical and chemical agents in the environment, (2) to review available evidence on the health effects of such exposures, and (3) to consider policy questions raised by the scientific evidence. Includes lectures on methodology, seminars on the review and criticism of current literature, and presentations by outside experts on the evaluation and impact of epidemiologic data.
Prereq. EPI 201a and BIO 101a,b; EHI 201a, 201b recommended but not required.

NUT-EPI 213a,b. Nutritional Epidemiology
Lectures. *One 2-hour session each week. 2.5 units.* Dr. el Lozy, Dr. Willett, Mrs. Witschi.
(Course described under Nutrition.)

EPI 300a,b,c,d,e. Tutorial Programs
Time and credit to be arranged.
Students may participate in departmental research in close association with a staff member. Time and credit are to be arranged with the Head of the Department.

EPI 350. Research
In selecting topics for research in doctoral programs, students should consider the fields in which members of the Department are currently working. These include:

Neoplastic Disease
Dr. MacMahon, Dr. Gutensohn, Dr. Hutchison, Dr. Monson, Dr. Morrison, Dr. Walker.

Congenital Malformation
Dr. MacMahon, Dr. Miettinen, Dr. Rothman, Dr. Yen.

Cardiovascular Disease
Dr. Rothman, Dr. Miettinen.

Effects of Contraceptive Agents
Dr. Rothman.

Environmental Epidemiology
Dr. Monson.

Statistical Methods
Dr. Miettinen.

Nutritional Epidemiology
Dr. Willett.

Health Policy and Management

HPM 100a,b. Economic Analysis (formerly **HPM 101a,b,c.**)
Lectures, seminars. *Three 2-hour sessions each week. 7.5 units.* Dr. Hemenway.
Designed to bring students to an intermediate-level understanding of economic theory. Students will become familiar with economic approaches to problems and with microeconomic models and concepts, their uses and limitations.
Required for students in the Health Policy and Management Program.

HPM 200c. Health Economics (formerly **HPM 201d.**)
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Hemenway.
Examines the economic aspects of production, distribution, and organization of health services. Devoted to applying the framework of economic analysis to the health services sector. Topics normally include: the supply and demand of medical care facilities, markets for health manpower, financing of medical care, cost-benefit analysis, and problems of health planning.
Required for students in the Health Policy and Management Program.
Prereq. HPM 100a,b or equivalent or permission of instructor.

HPM-HSA 205a,b. Economic Analysis for Public Health
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Members of the Department.
Provides an introduction to the basic principles of economics and economic analysis, particularly as they apply in the public health field. A systematic introduction to microeconomic theory includes the determinants of supply and demand, the theory of markets, and the concept of economic efficiency. In addition, attention is given to public expenditures and policy analysis.

HPM 207c,d. Economics of Health Planning (formerly **HPM 220c,d.**)
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Mr. Hsiao.
Applies economic analysis to planning of health programs. Application is emphasized over theory. Examines planning and regulation in a market economy and develops analytical tools, including systematic analysis, econometrics, modeling, simulation, and cost-benefit analysis. Health policy topics include: national health insurance, health manpower, resource allocation, and hospital facilities. Skills in using analytical techniques appropriately are developed. Case study material used. Course especially appropriate for students who intend to pursue a career in planning and evaluation of health programs.
Prereq. One semester each of statistics and microeconomics.

HPM 209d. Seminar in Economics for Health Policy Analysis (formerly **HPM 221d.**)
Seminars. *One 3-hour session each week. 2.5 units.* Dr. Taylor.
Not given 1980-81.
Focuses on topics in the economics of health policy. Themes vary from year to year, but typically include: econometric models, the role of government in the health sector, analysis of government regulatory programs, the production of physicians' services, distributional aspects of national health insurance, and the market for blood in the United States.
Prereq. HPM 100a,b, HPM-BIO 210b,c,d or equivalent, and permission of the instructor.

HPM 211c. Quantitative Policy Analysis (formerly **HPM 208c.**)
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thompson.
The purpose is to provide students with motivation to analyze health problems quantitatively. Techniques include decision analysis and cost benefit analysis. Readings from health policy and management literature are used to illustrate the techniques and their limitations.
Required for students in the Health Policy and Management Program.

BIO-HPM 212a. Forecasting and Its Use in Health Programs and Institutions (formerly **BIO-HPM 206d.**)
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Reed, Members of the Departments of Biostatistics and Health Policy and Management.
(Course described under Biostatistics.)

HPM 213d. Introduction to Operations Research (formerly **HPM 209d.**)
Lectures, discussions. *Two 1½-hour sessions each week. 2.5 units.* Members of the Department.
Presents some of the basic models of operations research. Techniques incudes linear programming, queueing theory, simulation, and PERT/CPM. The purpose is to provide students with motivation to analyze health care problems quantitatively. Readings from health policy and management literature are used to illustrate the various techniques.
Required for students in the Health Policy and Management Program.
Prereq. HPM-BIO 219b,c,d or equivalent.

BIO-HPM 215c, 215d. Health Program Evaluation
Lectures, discussions. *One 2-hour session each week. 1.25 units each period.* Dr. Reed.
(Course described under Biostatistics.)

HPM-BIO 216c. Analysis of Health and Medical Practices (Public Policy S-176m)
Lectures, discussions. *Two 1½-hour sessions each week. 2.5 units.* Dr. Weinstein.
Concerns the analysis of clinical procedures and health programs, and examines uses and limitations of quantitative methods such as decision analysis and cost-benefit analysis. Topics include: resource allocation in the management of hypertension, treatment decision for acute abdominal pain, diagnosis of renovascular disease, screening for glaucoma, and coronary artery bypass surgery. Implications for quality assurance and medical reimbursement policies are considered.
Prereq. Some facility with quantitative methods, preferably with some elementary knowledge of statistics, decision analysis, or economics.

HPM 217b. Decision Analysis and Evaluation (formerly **HPM 211b.**)
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Thompson.
Provides an overview of important, recent developments in decision analysis and their applications to clinical, policy, and evaluation problems in health. Emphasizes the appropriate use of analytic techniques for decision making, recognition of their short-comings and limitations, and their role in program evaluation. Topics include: evaluation planning, measurement of health status, r-o-c curves, multi-attributable decision making, and multi-person decision making.

HPM 218d. Clinical Decision Making
Lectures, case discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Fineberg, Dr. Berwick, Dr. Weinstein, Dr. Frazier.
The course will enable students to apply the principles of decision analysis to problems of patient care. Clinical situations are characterized by a number of features which are amenable to the technique of decision analysis. These features include: a complex sequence of events, the presence of uncertainty, the need to select and utilize relevant information, the frequent necessity of trade-offs, and the ultimate concern with outcomes which can be positively or negatively valued.
Prereq. HPM 217b or permission of the instructor.

HPM-BIO 219b,c,d. Statistical Methods for Health Policy and Management (formerly **HPM-BIO 206a,b,c.**)
Lectures. *Two 1½-hour sessions each week. 7.5 units.* Dr. Thibodeau, Dr. Mehta.
An introduction to statistics and probability emphasizing their application in a variety of health policy and management contexts. Goals include establishing an awareness of basic statistical reasoning and recognition of common difficulties in application. Topics include: distributions, analysis of studies, inference (estimation and hypothesis testing), and applied regression analysis. Time-sharing computing will be used throughout.
Required for students in the Health Policy and Management Program.
Prereq. One college-level course in mathematics. Enrollment of students not in the Health Policy and Management Program subject to approval of the instructor.

HPM 220a,b/220c,d. Administrative Systems (formerly **HPM 204a,b/204c,d.**)
Lectures, seminars. *Three 2-hour sessions each week. 5 units each semester.* Dr. Young, Dr. Barrett, Dr. Trevelyan.
Examines issues related to managing health care organizations. Classes include: organizational theory, strategy, leadership, change and conflict, labor relations, financial accounting and analysis, cost accounting, and management control systems. Encourages students to take an administrative systems perspective, thereby viewing the managerial process in a more holistic way than is permitted by traditional functional analysis.
Required for students in the Health Policy and Management Program.
Prereq. HPM 220a,b or equivalent if HPM 220c,d taken separately.

HPM-HSA 221a,b. Administration of Health Services (formerly **HSA-HPM 201a,b.**)
Lectures, discussions, case studies. *Two 2-hour sessions each week. 5 units.* Dr. Yerby. Members of the Department.
Examines the structural and functional characteristics and the sociology of health institutions and organizations, and environmental constraints such as resources, law and regulation, mandate, and societal expectations are examined. Management theory and practice, in the context of health services, emphasized in respect to organizational behavior, institutional strategy, financial management, management control and operations management. Law and the managerial role, including such issues as authority, liability and confidentiality are considered with particular reference to the social role of health services.
Required for students in the M.P.H. program.

HPM-HSA 222a,b. Administration of Personal Health Services (formerly **HSA-HPM 203c,d.**)
Seminars, field projects. *One 2-hour session each week. 2 units.* Dr. Kasten.
Designed for students who will be administrators of personal health service programs. Inpatient, ambulatory, home, and rehabilitation programs are treated from an operational and preventive perspective. Special emphasis is placed on administrative problem solving. Students analyze administrative problems in operating personal care service programs.
Enrollment subject to approval of the instructor.

HPM 223a,b. Personnel and Labor Relations (formerly **HPM 235a,b.**)
Case discussions. *Two 2-hour sessions each week. 5 units.* Members of the Department.
Utilizes cases plus a text and places approximately equal emphasis on union-management and personnel topics. Labor and personnel topics are integrated. Labor elements of the course emphasize the grievance, arbitration, and

negotiation processes including a negotiation exercise. Personnel concentrates on intellectually challenging topics including social legislation. Available health care cases will be utilized.

HPM 225d. Health Care Operations Management
Lectures, case studies, discussions. *Two 1½-hour sessions each week. 2.5 units.* Members of the Department.
The objective is to familiarize students with a variety of operating systems in a health care environment and to present significant issues related to the types of decision situations a health care manager faces in practice. Subjects include: labor productivity monitoring, resource management, information systems evaluation, materials management, nursing staffing, elective admissions scheduling, operating room scheduling, and hospital drug distribution systems.
Prereq. Basic course in statistics or quantitative methods, or permission of the instructor.

HPM 233a. The Management of Organizational Design and Change
Lectures, case presentations, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Barrett.
Examines changes made in health delivery organizations, the reasons for them, and their impact. Considers the management of organizational disruption and alternative health organization designs more adaptable to change.

HPM-HSA 236d. Planning in the Hospital Setting
(formerly **HSA-HPM 207d.**)
Lectures, seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Yerby, Ms. Bander.
Designed to acquaint students with the concepts and strategies of planning in the hospital setting. Offers practical understanding of the current status and potential application of organized planning efforts in the modern hospital. Environmental issues explored as well as the status of and outlook for multi-institutional planning endeavors. Special emphasis placed upon the perspective and approach of the organization.
Enrollment subject to approval of the instructors.

HPM 237c. Financial Management in Health
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Young, Mr. Hourihan.
Concerned with management of the flow of funds through a health organization. Makes use of data supplied by the accounting system to help organizations make rational resource allocation decisions. Focuses on several techniques required for effective short- and long-term financial management. Takes the perspective of manager, although some attention will be given to understanding the financial environment, including capital markets.
Prereq. HPM 220a,b, 220c,d, or HPM-HSA 221a,b or equivalent.

HPM 238c. Introduction to Management Information Systems
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Young.
Examines basic principles of computer systems and computer systems programming relating to the effective use of computer based information systems in organizations. Includes basic computer structures, computer language, operating systems, programming, security, and telecommunications. Discusses different types of information systems in relation to organizational needs.
Prereq. HPM 220a,b, HPM 220c,d or HPM-HSA 221a,b.

HPM 240a, 240d. Health Care Issues and Institutions (formerly **HPM 202c,d.**)
Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Fineberg.
Describes major health care issues and the development and implementation of policies and programs which address those issues. Topics include: health manpower, ambulatory and hospital-based care, new medical technology, health care finance, and health planning and regulation. Readings include case studies and major writings in the field of health services research.
Required for students in the Health Policy and Management Program.

HPM-HSA 243c. Seminar in Health Planning and Regulation (formerly **HSA-HPM 206c.**)
Lectures, seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Yerby, Ms. Schauffler.
Provides an overview of area-wide health planning and regulation as performed by health planning agencies created under PL 93-641. Includes instruction in health planning and review techniques used in health planning and regulation through seminars, case studies, student projects, and field visits. Also covers the purposes and history of area-wide health planning and regulation, and the current structures and functions of health planning agencies.
Prereq. Background in economics and quantitative methods, planning experience desirable.

HPM 245d. Design and Implementation of Health Care Regulation (formerly **HPM 231d.**)
Seminars. *One 3-hour session each week. 2.5 units.* Dr. Feldman.
Analyzes the policy choices which are inherent in government programs intended to change the behavior of health care providers. Cases are drawn primarily from planning and regulatory programs at the federal and state levels in the United States.

HPM 250d. Policy Implementation
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Feldman.
Intended to help students think systematically about some of the reasons public programs succeed or fail. It assumes that the choice of appropriate and effective institutional arrangements for accomplishing policy goals is itself an important policy question. Examples are taken from a variety of policy areas.
Required for students in the Health Policy and Management program.
Presumes knowledge of material presented in HPM 101ab and HPM 208c.

HPM-HSA-MCHA 252a,b. Human Rights in Health (formerly **HSA-HPM-MCHA 212a,b.**)
Lectures. *One 2-hour session each week. 3 units.* Dr. Curran.
Entails a comprehensive examination of human rights as they bear upon health programs, nationally and internationally. Among topics considered from ethical, cultural, and legal viewpoints are rights to medical care and a healthy environment, equality, rights of medical patients, women, children, and experimental subjects; and problems of balancing personal rights and community protection.
Enrollment limited. Auditing and convenience attendance not permitted.

HPM 253e. Government and Private Funding for Research and Health Care Programs (formerly **HPM 230e.**)
Lectures, discussions, workshops. *To be arranged. 1 unit.* Members of the Department.
To carry out research or develop needed health care programs, managers and policy analysts need to be able to obtain funding from federal, state, and local sources, and from foundations and corporations. This course aims to enable participants to demonstrate in a clear and concise proposal an understanding of the issues and facility with methodological design. Requirements for proper administration of funds are also discussed. Proposals are prepared and critiqued in the workshops.
Prereq. Exposure to research issues in health care or program development and permission of the instructor.

HPM 255d. Reimbursement Systems (formerly **HPM 227d.**)
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Young.
Examines issues related to the general theme of third-party reimbursement for health care institutions. The principal focus is on hospitals. Issues include: cost containment efforts, hospital perspectives, and the role of incentives. Some specific systems are examined in detail in order to assess the feasibility of certain techniques and to address questions of overall reimbursement system design.

HPM 257b. Quality Assurance in Health Services (formerly **HPM 229d.**)
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Palmer, Visiting Lecturers.
Examines issues in defining "quality in health care" and the choice of methods for assessing and improving quality of health care. Recent research is reviewed and currently operating programs, including PSROs, are analyzed. Presentation includes case materials from quality assurance programs in both hospital and ambulatory settings.

HPM-HSA-POP 262c,d. Health Planning in Developing Countries (formerly **HSA-HPM-POP 223c,d.**)
Lectures, seminars. *One 2-hour session each week.*
Laboratory. *One 1-hour session each week* (optional). *2.5 units.* Dr. Cash, Mr. Hsiao, Dr. Shepard.
Deals with the disciplinary content and methodologies of health planning through lectures, seminars, and case studies. Strong emphasis is placed on the economic analysis of health issues in developing countries. Selected concepts and techniques of microeconomics, cost effectiveness, and cost benefit are presented and applied to health care programs. These techniques are then incorporated into a health planning context in analyzing selected health plans and in writing a health plan. Emphasizes practical and applied work.
ID 209a,b is recommended, but not required. A background in economics is not required.

POP-HPM-HSA 263c, 263d. The Design and Management of Population Programs (formerly **POP-HSA-HPM 235c,d.**)
Case discussions, seminars. *Two 2-hour sessions each week. 5 units.* Dr. G. Berggren, Dr. Wray, Dr. Ewbank, Dr. Wyon.
(Course described under Population Sciences.)

HPM-HSA 264a,b. Health and Social Welfare Systems in Cross-National Perspective (formerly **HSA-HPM 220c,d.**)
Lectures, seminars, case discussions. *Two 2-hour sessions each week. 5 units.* Dr. Yerby, Dr. Dieter Koch-Weser (Associate Professor of Preventive and Social Medicine, Harvard Medical School).
Modernization and industrialization have affected the health and economic security of individuals and families. Cyclic unemployment, industrial accidents and disease, temporary and permanent disability, and the social and financial deficits of old age are among the problems of modern nation states. The course examines the mechanisms that have evolved in different societies to ameliorate these hazards. The interrelatedness of health and social welfare programs and services is explored.

HPM-HSA 265d. The Health Maintenance Organization: Exploring an Alternate Care System (formerly **HPM 204d.**)
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Yerby, Mr. Pyle.
Recent national concerns with improving health care have promoted the HMO as an alternative care system. This course explores the background of this movement, its liabilities and progress, and the evolving legislation. Reading and materials are taken from operating plan experiences. A seminar format is used. The students, working in groups, will prepare proposals for the organizational, marketing, financial, and delivery programs of a newly developing HMO.
Enrollment is limited to 20 students and is subject to approval of the instructor.

HPM-EHS 267a,b. Political Economy of Environmental Health Regulations
Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Roberts.
Examines the circumstances under which governmental intervention is appropriate to protect human health and the environment. Focuses on the likely consequences of choosing one or another regulatory strategy to reach specific environmental health objectives.

HPM-EHS 269c,d. Environmental Health Policy Analysis (formerly **HPM-EHS 230c,d.**)
Lectures, case discussions. *Two 2-hour sessions each week. 5 units.* Dr. Roberts, Dr. Cooper.
Using the case method, demonstrates the application of analytic and technical skills to actual policy situations. The multidisciplinary approach will emphasize the technical uncertainties and the evaluative and institutional complexities surrounding environmental policy issues. Policy questions will be considered in an organizational context permitting students to consider the uses and limitations of formal methods of analysis.
Prereq. Previous coursework in policy, management, or environmental health sciences.

HPM-HSA 272d. Issues in Mental Health Policy (formerly **HSA-HPM 210d.**)
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Benjamin Liptzin (Assistant Professor of Psychiatry, Harvard Medical School).
Examines major policy issues in mental health and approaches to analyzing them. Among the

topics covered are: community mental health, de-institutionalization, financing, mental health manpower, health/mental health interface, and legal issues.
Prereq. Familiarity with mental health problems and programs desirable.

HPM-HSA 275a,b. Dental Public Health Practice (formerly **HSA-HPM 217a,b.**)
Seminars, field visits. *One 2-hour session each week. 2.5 units.* Dr. Yacovone.
Provides in-depth training in the administration and planning of dental health programs. Subjects include: community needs, resources, surveying, fluoridation, prepayment, and program evaluation. Each student develops a program plan in a specific area of community dental needs and presents the plan to the class.

HPM-HSA 276c,d. Dentistry and Social Policy (formerly **HSA-HPM 218c,d.**)
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Yacovone.
Investigates relationships between the social sciences and dentistry. Subjects include: the role of the social sciences in dentistry, psychosocial interaction of doctor and patient, client perceptions of dentistry, interpersonal relationships in group practice, and the sociopolitical influence of dentistry as an organization.

HPM 290a,b,c,d. Applied Research Seminar (formerly **HPM 240a,b,c,d.**)
Seminars. *One 2-hour session each week.*
Field work. *One day each week. 10 units.* Members of the Department.
Students will work on a specific problem in an operational setting under the guidance of both clinical and academic faculty members. In the seminar, faculty and preceptors from a variety of organizations discuss cases which relate thematically to the field work experiences. Two research reports required.
Required for students in the Health Policy and Management Program.
Prereq. Completion of the first year of the Health Policy and Management Program.

HPM 300a,b,c,d,e. Tutorials
Time and credit to be arranged.
Students may make individual arrangements to do work under the guidance of a member of the department. This work may include readings or special projects.

HPM-HSA 330. Field Work
Time and credit to be arranged.
Students are assigned to work on special projects such as group surveys, other types of field projects, or observation of and limited participation in the work of health agencies. Field assignments are made on an individual basis to meet the needs of each student insofar as possible. Work in the field is coordinated with courses in the Department.
332 *Community Health Improvement Project*
Summer full-time or weekly part-time placement in local communities.
Credit to be arranged.

HPM-HSA 350. Research
Doctoral candidates may register for HPM-HSA 350 to undertake individual study and research.

Maternal and Child Health and Aging

MCHA 101a, 101d. Child Growth and Development
Lectures, self-instructional material. *One 2-hour session each week. 2.5 units each period.* Dr. Valadian, Dr. DeLollis.
Individualized instruction in the physical growth, development, and maturation of children is presented in programmed, self-instructional material, and supplemented by lectures. Covers topics necessary for the advanced study of growth and development. Designed for MCHA students who do not have a strong background in physical development, but may also be taken by health providers who wish to refresh their knowledge, with permission of the instructors.

MCHA 201b. Child Growth and Development II: Advanced Seminar
Seminars. *One 2-hour session each week. 1.25 units.* Dr. Valadian, Dr. DeLollis.
Describes and integrates the characteristics of human growth and physical development which occur during the various life stages from conception to maturation. Intended for students with special interest in human development, but also provides an understanding of assets and needs particular to the MCHA populations which constitute a basis for health services. Thus, MCHA 201b is given parallel to MCHA 210b and MCHA 203b.

MCHA 201c. Child Growth and Development III: Factors Affecting Growth and Development
Lectures, seminars. *One 2-hour session each week. 1.25 units.* Dr. Valadian, Dr. DeLollis.
Explores definable influences that act on the course of physical growth and development from conception to maturity. Emphasis is placed on understanding the nature of the factor and its direct effects, as well as on how factors interrelate to produce some characteristics of mature individuals. This course also considers implications of factors for planning and providing health services and for future research.
Prereq. MCHA 101 or permission of the instructor.

MCHA 202e. Primary Maternal and Child Health Care
Seminars, lectures, field visits. *Full-day sessions. 1.25 units*. Dr. Valadian, Members of the Department.
Introduces the student to principles of organization and administration of primary heath care services for mothers and children. Concepts of primary care, neighborhood health centers and quality assurance are presented. Seminars focus on the issues and problems presented in the field visits. The community programs selected are diverse, including neighborhood health centers, private practice, hospital primary care, and university health care.

MCHA 203b. Content of Maternal and Child Health Services
Seminars. *Two 2-hour sessions each week. 2.5 units*. Dr. Valadian, Members of the Department, Guest Lecturers.
Components of health care services to mothers and children are discussed as they vary to meet the changing needs resulting from growth and maturational processes. Health services appropriate to maternity, early and late childhood, adolescence, and youth are presented in terms of the multidisciplinary and interdisciplinary action they require.
Prereq. Completion of MCHA 101, concurrent enrollment in MCHA 201b, or permission of the instructor.

MCHA 204c,d. Programs and Issues in Maternal and Child Health Services
Lectures. *Two 2-hour sessions each week. 5 units*. Dr. Valadian, Members of the Department, Guest Lecturers.
Beginning with the historical background and the relationship of maternal and child health programs to social, mental health, education, and other systems, the course discusses factors which shape current and future maternal and child health policies and services. It considers the organization and administration of national, state, and local maternal and child health and handicapped children services and examines selected issues such as child abuse, lead poisoning, and day care.
Prereq. MCHA 201b and 203b or permission of the instructor.

MCHA 205d. Research Approach to Growth, Development, and Health of the Child
Seminars. *Two 2-hour sessions each week. 2 units*. Dr. Valadian, Dr. Reed.
Methods of obtaining and evaluating data on child growth, development, and health, and the construction of norms are studied, including the design of studies dealing with interrelationships among various aspects of the child's progress, background, and environment.
Enrollment subject to approval of the instructors.

MCHA 206c,d. Maternal and Child Health in Developing Countries
Seminars. *One 2-hour session each week. 2.5 units*. Dr. Wray.
Using readings, discussions, and case presentations, considers issues of high priority in the health of mothers and children in developing countries, placing particular emphasis on the interactions between health and poverty in societies in rapid social and cultural transition. Complements, but is not a substitute for, the issues raised in ID 209a,b. Considerable reading is required to fulfill the course objectives.

MCHA-NUT 207c,d. Nutrition in Child Growth and Development
Lectures, discussions. *One 2-hour session each week. 2.5 units*. Dr. Dwyer, Visiting Lecturers.
Principles and practical problems encountered in the nutritional aspects of child growth and development are examined. Lectures on general principles are designed to help students base their judgments on scientific evidence. Discussions deal with a variety of nutrition case studies and simulations illustrative of problems in both developing and highly industrialized countries.

MCHA 208d. Rural Health Services
Seminars. *Two 2-hour sessions each week. 2.5 units*. Dr. Hayes.
Lectures and discussions focus on the characteristics of rural culture and in the problems in identifying and providing for health needs of isolated communities. Areas of concern to be examined are Mississippi, Appalachia, Indian health and migrant workers.

MCHA 209c, 209d. Social Services for Mothers and Children
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units each period*. Dr. Deykin.
Services for children and families are examined in terms of welfare legislation and the social factors that delineate their needs. Factors pertinent to the utilization of established programs and the newer self-help groups are discussed. The "c" period focuses on services for children including social services for the hospitalized, the seriously injured and the terminally ill child and his family, and foster home placements and adoption. The "d" period concentrates on services for adolescents and mothers including programs related to addiction, pregnancy, and battered women.

MCHA 210a. An Introduction to Personality and Cognitive Development
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units*. Dr. Walker.
The basic principles of child growth and development in the cognitive and the psychosocial domains are examined in this introductory course. Special emphasis placed on understanding the theories and research of Piaget, Freud, Erikson, and others, as well as the implications of these contributions to the planning and implementation of medical and/or related social and educational services for children and youth.

MCHA 211b. Health Care of Women
Seminars. *Two 2-hour sessions each week. 2.5 units*. Dr. Valadian.
Considers critical issues of health care and the common problems of women, including the changing role of women in contemporary United States society. These health problems are addressed in terms of their epidemiology and the impact of technology on the detection and treatment of these problems viewed from biological, medical, behavioral, and legal perspectives.
Enrollment limited to 20 students and subject to approval of the instructor.
Prereq. Basic knowledge of reproductive biology.

MCHA 213d. Dental Health Services in Maternal and Child Health
Lectures, discussions, student presentations. *One 2-hour session each week. 1.25 units.* Dr. Hargreaves (Professor of Pediatric Dentistry, Harvard School of Dental Medicine, and Children's Hospital Medical Center).
Examines dental health services available to treat and prevent dental disease related to expectant and nursing mothers and young children. Discusses the etiology of dental disease — dental caries, periodontal disease, and disturbances in occlusion — in young children and mothers. Critically assesses the role of preventive methods available and those under investigation and examines the differing modes of delivery accepted in different countries. Geared toward health professionals interested in including dental health services in the programs they will plan.

MCHA 214a,b. The Elderly Person in the Health Care System (HMS Geriatrics 702)
One 3-hour session each week. 2.5 units. Dr. Lawrence Branch (Assistant Professor of Preventive and Social Medicine, Harvard Medical School).
Uses a variety of public health perspectives to analyze the health needs of the elderly and services to meet them. Topics include: demographic background of the "graying" of America, normal and pathological aging processes, epidemiology of geriatric illness, design and administration of present alternative forms of long-term care, and cross-national perspectives.

MCHA-BEH 237c,d. Child Development and Social Policy (Education P-220)
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Walker.
Analyzes how knowledge of child development relates to the planning and implementation of social policy. Of primary concern are the relevance and utility of basic data from research and evaluation studies in psychology, pediatrics, and related disciplines in the creation of health and education programs and policies concerned with children and adolescents.
Prereq. Knowledge of basic child development and of research methodologies and statistics.

HPM-HSA-MCHA 252a,b. Human Rights in Health
Lectures. *One 2-hour session each week. 3 units.* Dr. Curran.
(Course described under Health Policy and Management.)

MCHA 300. Tutorials
Time and credit to be arranged.
Students at the master's level may arrange to work individually or in small groups under the guidance of a faculty member. The work may include participation in departmental research, specialized readings, field projects in a local or state health agency, or small studies to examine more in-depth topics introduced in various courses such as: planning and evaluation of MCHA services for children with handicapping conditions.
Tutorials will be offered depending on students' interests and they are limited by the amount of faculty time that is available. Arrangements must be made with individual faculty members.

MCHA 330. Field Study
One-week period between fall and spring terms. 1 unit.
Field study will be arranged on an individual basis to meet the special needs of each student insofar as possible.

Additional Field Study
Students who lack sufficient previous experience are encouraged to undertake a period of field study before registration or after completion of the academic year, in a program arranged by the staff of the Department. No credit is allowed for such field study.

MCHA 350. Research
Doctoral students may undertake research in maternal and child health or aging by arrangement with the Head of the Department.

Microbiology

MIC 202b. Critiques of Current Literature on Infectious Diseases
Seminars. *One 2-hour session each week. 1 unit.* Dr. Grant.
Papers on topics of general interest are selected from current periodicals and critically reviewed as to soundness of experimental design, validity and significance of results and conclusions, organization of manuscript, and clarity of presentation.

MIC 203d. Clinical Problems in Infectious Diseases
Lectures, clinics. *One 2-hour session each week. 1 unit.* Dr. Louis Weinstein (Visiting Professor of Medicine, Harvard Medical School).
Problem cases concerning diagnosis, treatment, and control of the common acute communicable diseases of temperate climates are presented, together with discussions of infectious diseases that are usually not considered communicable.

MIC 204b. Laboratory and Immunologic Aspects of Infectious Diseases
Lectures. *Two 1-hour sessions each week.*
Laboratory. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
Introduces the microbiologic and immunologic techniques currently utilized by research and diagnostic laboratories for studying infectious diseases. Characterization and diagnosis of infectious agents of current public health importance are stressed, as well as the immunological principles involved. Students perform in detail cultural and biochemical techniques for viruses, bacteria, and rickettsiae, and a variety of relevant immunological techniques.
Enrollment subject to approval of the instructor.

MIC 205a,b/205c,d. Departmental Seminar
Seminars. *One 1-hour session each week. 1.25 units each semester.* Dr. Grant, Members of the Department.
Helps students develop the skills required to organize and give an effective public presentation. Students will attend and present seminars reviewing their research progress and/or relevant literature. Topics include: aspects of epidemiology, molecular biology, immunology, and virology as they relate to infectious disease or oncogenesis.

PHY-MIC 212a,b. Environmental Carcinogenesis
Lectures, seminars. *One 1-hour and one 2-hour session each week. 5 units.* Dr. Kennedy, Dr. Eisenstadt.
(Course described under Physiology.)

MIC 213d. Intracellular Microorganisms Pathogenic for Man
Laboratory exercises, seminars. *Two 3-hour sessions each week. 2.5 units.* Members of the Department.
Provides an understanding of the techniques available for studying the growth and the characteristics of representative strains of rickettsiae, chlamydiae, and viruses which are human pathogens. Under staff supervision, each student performs the procedures for identification and characterization of unknown pathogens.
Enrollment limited to 16 students with prior approval of the instructors. The course will not be given if less than 6 students enroll.
Prereq. MIC 204b or equivalent.

MIC 214b. Case Studies in the Epidemiology of Infectious Disease
Seminars, laboratory exercises. *One 2-hour session each week. 1.25 units.* Dr. Nichols.
Deals with problems in the epidemiology of communicable and other acute diseases. Students will assume the role of investigator or control officer in the study of actual cases of epidemics and other acute disease control situations.
Prereq. BIO 101a,b or equivalent, EPI 201a.

MIC 216d. Sexually Transmitted Diseases
Lectures, seminars. *One 2-hour session each week. 1 unit.* Dr. Nichols, Guest Lecturers.
Discussion centers on why sexually transmitted diseases that are easily cured are out of control. Reviewed topics include: pathobiologic, epidemiologic, and biosocial aspects of venereal diseases, such as patterns of sexual behavior; lay and professional attitudes toward venereal disease and patients; and legal and economic aspects of control. Interaction of students from both social and medical sciences benefits the examination of possible new approaches for dealing with the problems. The student participates in V.D. clinics and in contact tracing with nurse epidemiologists in the Boston area.

MIC-TPH 217a. Virology
Lectures, seminars. *Three 1-hour sessions each week. 2.5 units.* Dr. Essex.
Provides students with fundamentals of human virology and introduces the new and relevant concepts emanating from recent and ongoing research. Topics include: virus-host cell interaction, pathogenesis, chronic and latent infections, epidemiology, environmental factors, host defense mechanisms, and community control measures. Selected virus groups discussed in detail.

MIC 219c,d. The Molecular Biology of Cancer
(Biophysics 203)
Lectures. *One 2-hour session each week. 5 units.* Dr. Haseltine, Dr. Chen (Assistant Professor of Pathology, Harvard Medical School).
Examines the nature of cancer at the molecular level and explores the differences between normal cells and tumor cells in tissue culture. Draws upon cell biology, viral oncology, tumor immunology, and genetics. Specific topics include viral and chemical carcinogenesis, genetics of cancer and the transformed state.
Prereq. Previous training in biochemistry, cell biology, and virology, and permission of the instructors.

MIC 300a,b,c,d. Tutorial Programs
Time and credit to be arranged. Members of the Department.
Enrollment requires the consent of the staff member responsible for supervision of the research. The various subject areas are listed below by category.

302 *Viruses*
Dr. Essex, Dr. Cerny, Dr. Haseltine.
Isolation and identification of representative viruses by use of cell culture, animal inoculation, and serologic techniques.

303 *Immunochemical Methods*
Members of the Department.
Experiments with immunofluorescence, chromatography, immunoelectrophoresis, enzyme-coupled antibody, labeled isotopes, and other techniques applied to research on microorganisms and mechanisms of hypersensitivity.

304 *Public Health Laboratory*
Associates at the State Laboratory Institute.
The State Laboratory Institute is engaged in a variety of programs related to public health. These include the development, preparation, and testing of new and standard serums, vaccines, and blood fractions; research in various aspects of applied immunology; various aspects of diagnostic service in the fields of bacteriology, virology, and congenital metabolic disorders; and field studies on arboviruses. Individual arrangements for study can be made in any of these programs.

305 *Tumor Biology*
Dr. Essex, Dr. Cerny, Dr. Grant, Dr. Haseltine, Dr. Cairns.
Approaches and techniques for the study of cancer as an infectious disease. Procedures used to study tumor cell and tumor virus marker antigens and antibodies demonstrated. The significance of these markers for epidemiological, etiological, and diagnostic investigations of various tumor systems of known and unknown cause discussed. The relationship between the immune response and the oncogenic process examined.

306 *Cellular Immunology*
Dr. Cerny, Dr. Grant, Dr. Eardley.
Differentiation and characterization and factors, including immunoglobulins, that might be involved in regulation of the immune response. The studies involve the use of various immunological techniques.

308 *Health Problems in Selected Underdeveloped Countries*
Dr. Nichols.
Problems are studied in the historical context of their political, socioeconomic, and cultural development. Reading assignments are discussed in small seminars. Students with experience in international health preferred.

MIC 350. Research
Qualified doctoral candidates, research fellows, and full-time special students may register for MIC 350 to undertake original research in virology, bacteriology, immunology, or in one of the disciplines available at the State Laboratory Institute. A number of the current research activities of the Department are indicated under MIC 300. Inquiries about specific research opportunities should be addressed to the Head of the Department.

Nutrition

NUT 201a,b. Principles of Nutrition
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. el Lozy, Dr. Hayes, Dr. Thenen.
An in-depth study of the essential nutrients, with special attention to the problems of estimating human requirements. The consequences of nutritional deficiencies and excesses will be discussed.

NUT 203c,d. Nutrition Policy Formation and Program Operation
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Austin.
Deals with the formation of food and nutrition policies and the operation of nutrition intervention programs aimed at the major nutritional problems in the United States and in the developing nations. Employs a multidisciplinary and case study approach to develop skills in analyzing and formulating nutrition policies and plans, and to sharpen problem-solving and decision-making capacities regarding nutrition program operation.
Prereq. NUT 201a,b or NUT 210a,b or permission of the instructor.

NUT 204a,b/204c,d. Departmental Seminars
Seminars. *Two 1-hour sessions each week. 2.5 units each semester.* Dr. Thenen, Members of the Department.
Students participate in and present seminars reviewing current research and publications related to nutrition in addition to attending advanced seminars presented by faculty and guest speakers. Beginning students learn skills required for oral presentations. Topics include both basic research and applied areas of nutrition.

NUT 205c,d. Biochemistry and Physiology of Nutrition
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. K. Hayes, Dr. Nicolosi, Dr. Thenen, Members of the Department.
The biochemistry and physiology of carbohydrates, fat, protein, vitamins, and minerals are integrated from the nutritional perspective. Course provides an in-depth analysis for students with a major interest in nutritional biochemistry.
Prereq. Course in biochemistry and permission of the instructors.

NUT 206c,d. Laboratory and Animal Research Techniques
Lectures, demonstrations. *One 3-hour session plus 2 additional hours each week. 5 units. Reduced credit may be arranged for students not majoring in nutrition.* Dr. Geyer, Dr. Antoniades, Dr. Nicolosi, Members of the Department.
Opportunity to learn the principles and practice of modern experimental animal and laboratory research techniques by means of discussions and laboratory work. The course involves both instrument-oriented and project-oriented exercises. The latter includes studies with animals and/or mammalian cell cultures as well as subcellular systems.

MCHA-NUT 207c,d. Nutrition in Child Growth and Development
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dwyer, Visiting Lecturers.
(Course described under Maternal and Child Health and Aging.)

NUT 208c,d. Nutritional Aspects of Human Disease
Lectures, case presentations, discussions. *One 2-hour session each week. 2.5 units.* Dr. Herrera-Acena, Dr. el Lozy, Mrs. Witschi, Members of the Nutrition and Dietetics Department, Peter Bent Brigham Hospital.
Reviews the role of diet in the causation and management of clinical obesity, diabetes mellitus, coronary artery disease, anemia, liver disease, alcoholism, gastrointestinal disorders, and renal disease. Early detection and prevention of these nutrition-related disorders considered.

NUT 209a,b. Food Science and Nutrition
Lectures, discussions. *Two 1-hour sessions each week. 2.5 units.* Mrs. Witschi, Dr. Samonds, Members of the Department.
Deals with nutrition in terms of the foods which supply mankind's nutrient needs, their composition and physical properties, and the positive and negative effects on nutrient qualities of food of genetic manipulation, agricultural practice, processing, storage, and cooking. The historical development of food technology, including methods of preservation and sanitation, is related to current methods employed in both developing and industrialized countries.

NUT 210a,b. Nutrition Problems of Less Developed Countries
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Herrera-Acena, Dr. Mora,
The nutrition problems of less developed countries are discussed in the context of basic human needs. The ecology and the biological and behavioral consequences of malnutrition are reviewed in detail. Special emphasis on issues in human biology relevant to the formulation of nutrition policy and programs.

NUT-EPI 213ab. Nutritional Epidemiology
Lectures. *One 2-hour session each week. 2.5 units.* Dr. el Lozy, Dr. Willett, Mrs. Witschi.
Reviews methods for assessing dietary intakes of populations and individuals. Students will gain experience in the actual collection, analysis (including conversion to nutrients by computer) and interpretation of dietary intakes. Case studies follow, involving specific diet disease relationships integrating information from international studies, secular trends, clinical trials, analytical epidemiology, and animal experiments.
Prereq. BIO 101ab, EPI 201a, and permission of the instructor for students who have not taken a course in nutrition.

NUT 300a,b,c,d,e. Tutorial Programs
Time and credit to be arranged.
Individual work under direction may be arranged. This can include laboratory studies, projects in applied nutrition, or library research.

NUT 350-365. Research
Time and credit to be arranged.
Facilities are available for doctoral students to do advanced work in nutrition along the lines of fundamental or applied research as related to public health and medicine. Areas currently receiving intensive and comprehensive study in the Department are as follows:

351 Dr. Geyer
Effects of growth factors and hormones on the metabolism of human cells in culture; nutrition and metabolism of isolated organs; complete blood replacement *in vivo* with artificial preparations.

353 Dr. Lown
Coronary artery disease; etiology of sudden death; derangements of the heart beat; exercise physiology; electrolyte metabolism.

356 Dr. Antoniades
Regulation of cell growth by hormonal growth factors derived from human serum or platelets; platelet-derived growth factor and atherogenesis; mechanisms of hormone transport and regulation.

357 Dr. Hayes
Nutritional pathology with specific interest in diet and disorders of lipid and lipoprotein metabolism, particularly atherogenesis in non-human primates.

358 Dr. Herrera-Acena
The role of nutrition and other environmental factors in the etiology and management of diabetes mellitus; the relationship of malnutrition to physical and cognitive development.

359 Dr. el Lozy
The quantitation of malnutrition in children in developing countries on the basis of anthropometric measurements; studies of mathematical models of growth; application of these models to the study of growth in chronic diseases of childhood (diabetes, cystic fibrosis, etc.).

360 Dr. Mora
The epidemiology of malnutrition, physical growth deficit, and cognitive retardations.

361 Dr. Thenen
Early development and the role of nutrition in obesity and insulin resistance in experimental animal models; effects of marginal folic acid deficiency on reproduction, hemopoiesis and resistance to infection; biochemical defects in vitamin B_{12} deficiency.

362 Dr. Verrier
Influence of neural factors, psychologic conditioning, and myocardial ischemia on susceptibility to ventricular arrhythmias and sudden death.

363 Mrs. Witschi
Computer-based interactive dietary history, analysis, and counseling programs.

364 Dr. Austin
Cost effectiveness of infant and child supplemental feeding in the United States. Cost-benefit methodology for assessing safe levels of food additives.

365 Dr. Huber
Trace mineral metabolism.

Admission limited and subject to approval of the instructor.

The following courses, offered in the Faculty of Arts and Sciences, may be of particular interest to students of nutrition.

Economics 1261. The World Food System
Half course *(fall term). Tu., Th., at 11 and a discussion hour to be arranged.* Timmer.
Prereq. Economics 10 or permission of instructor.

Dd-102. Dudley House Seminar: Blood
Half course *(spring term). Tu., 3-5.* Antoniades.
Note: Enrollment limited to 20.

Physiology

PHY 203a,b. Human Physiology
Lectures, conferences, demonstrations. *Two 1-hour and one 2-hour sessions each week. 5 units.* Dr. Valberg, Dr. Mead, Members of the Department.
Students lacking a background in biology are offered an intensive introduction to biological principles and to the physiology of cells, organ systems, and organisms. Some pathophysiology and a number of laboratory exercises are included.
Prereq. College courses in physics, chemistry, and mathematics, or permission of the instructor.

PHY 205c,d. Principles of Toxicology
Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. Tashjian, Members of the Laboratory of Toxicology.
Emphasis placed on mechanisms of injury resulting from environmental chemicals that enter organisms without purposeful intent at the molecular, cellular, organ system, and organismal levels. Methods used to detect, evaluate, analyze, and combat the toxic effects of chemicals are discussed.
Prereq. Organic chemistry, biological chemistry, and mammalian physiology.

PHY 206a,b. Pulmonary Cell Biology
Lectures. *One 2-hour session each week.*
Laboratory. *To be arranged. 5 units.* Dr. Sorokin, Dr. Brain, Staff of the Department, Guest Lecturers.
Given alternate years; 1981-82.
Surveys pulmonary structure and function, trachea to alveolus, from the viewpoint of cell biology. Examines biological properties of the more than 40 cell types present and considers how cell and tissue functions are integrated to provide for respiration, defense against airborne infection, and other metabolic functions. Knowledge gained in this course helps prepare the student for research on the lungs and helps give insight into pulmonary disease.
Prereq. College-level course in histology or cell biology and permission of the instructors.

PHY 207c,d. Radiation Biology
Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Little.
This course is divided into two parts: cellular and mammalian radiobiology. The first includes radiation chemistry; cell survival, transformation, and mutagenesis; cytogenic effects; UV-photobiology; and cellular and molecular repair processes. The second covers effects of radiation in man and characteristics of internal and external human exposure. The biologic basis of the acute radiation syndrome, and the human epidemiologic data for radiation carcinogenesis, are emphasized.
Prereq. PHY 203a,b or college-level course in biology.

PHY 208a,b/208c,d. Seminar in Toxicology
Seminars. *One 1-hour session each week. 1 unit each semester.* Dr. Tashjian, Members of the Laboratory.
Not given 1980-81.
Seminars, journal clubs, and discussions of topics in basic research and the current literature in toxicology and related fields.
Prereq. Background in toxicology and permission of the instructor.

PHY 210a,b. Advanced Toxicology
Lectures, discussions, seminars. *One 2-hour session each week.*
Laboratory. *To be arranged. 5 units.* Dr. Tashjian, Members of the Laboratory.
Not given 1980-81.
Examines experimental methods of research in toxicology. Includes individual laboratory work.
Prereq. PHY 205c,d or equivalent and permission of the instructor.

PHY-MIC 212a,b. Environmental Carcinogenesis
Lectures, seminars. *One 1-hour and one 2-hour session each week. 5 units.* Dr. Kennedy, Dr. Eisenstadt.
Considers the various factors involved in carcinogenesis and mutagenesis induced by environmental agents, emphasizing the biological basis of the *in vitro* and *in vivo* systems used for the evaluation of potential environmental carcinogens. Major areas include: enzymatic activation of chemical carcinogens, DNA damage and repair in bacteria and mammalian cells, mutation in bacteria and mammalian cells, mammalian cell transformation, and animal carcinogenesis.
Prereq. College-level cell/animal biology, PHY 203a,b or equivalent, or permission of the instructors.

PHY 260a,b/260c,d. Evaluation of Occupational Health Problems
Seminars, discussions. *One 2-hour session each week. 5 units each semester.* Dr. Wegman, Members of the Occupational Health Program.
Students will examine a specific occupational health problem either as an applied research project or as an analysis and evaluation of an occupational disease control program. The weekly seminar will provide the opportunity for student and faculty review of each project plan, data collection effort, approach to analysis, and final report. Faculty and guests will, in addition, discuss problems of a similar nature and how each have been evaluated and answered.
Prereq. BIO 101a,b, EPI 201a, EPI 202b, EHI 251c,d, EHI 254b and permission of the instructor.

PHY 272a,b. Structure and Function of the Mammalian Respiratory System (Biology 272)
Lectures. *One 3-hour session each week.*
Demonstrations, discussions. *To be arranged. 5 units.* Dr. Brain, Dr. Leith, Dr. Mead, Dr. McMahon (Professor of Biology, Division of Applied Sciences), Dr. Taylor (Professor of Biology, Faculty of Arts and Sciences).
Not given 1980-81.
An introduction to the structure and morphometry of the respiratory system of mammals (from lung to mitochondria) integrating structural and morphometric information with physiological data. Requirements include lectures, demonstrations, discussions, term paper, and oral presentations.
Prereq. College-level course in histology or cell biology.

PHY 300. Tutorial Programs
Time and credit to be arranged.
Opportunities are provided for tutorial work in the fields of pulmonary biology, toxicology, occupational medicine, and radiobiology.

PHY 350. Research
Doctoral candidates may undertake laboratory or field research under the direction of faculty members working in the following areas:
Occupational health
Dr. Wegman, Dr. Baker, Dr. Boden.
Radiobiology and experimental carcinogenesis
Dr. Little, Dr. Kennedy, Dr. Reynolds.
Pulmonary biology
Dr. Mead, Dr. Brain, Dr. Butler, Dr. Drazen, Dr. Feldman, Dr. Gehr, Dr. Hoppin, Dr. Leith, Dr. Sorokin, Dr. Valberg.
Toxicology
Dr. Tashjian, Dr. Eisenstadt, Dr. Greenlee, Dr. Ofner, Dr. Richardson, Dr. Schonbrunn, Dr. Rice, Dr. Toscano.
Community air pollution
Dr. Ferris.

Population Sciences

POP-BEH 130a,b. The American Household in Demographic Perspective
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Masnick.
Examines in the context of longer historical trends the recent dramatic changes in family structure brought about by changes in patterns of household formation, marriage, separation, divorce, remarriage, childbearing, female labor force participation, and mortality. Implications for elements of the social order receive emphasis, including general integration of age structure, characteristics of the labor force, familial support in health care, and the housing market.

POP 185a,b. Applied Mathematical Demography (Sociology 185)
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Keyfitz.
Topics include: probabilities of survival and of childbearing; the general one-sex model and the stable special case; parity and interbirth intervals; cohorts and periods; and extension to two sexes and to changing rates of birth and death. Also covered are application to population prediction, inferring birth rates from censuses, occupational mobility, migration, kinship, and effects of birth control.
Prereq. One year of calculus.

POP 191a,b. The Spatial Aspects of Societies (Sociology 191)
Lectures. *Two 1-hour sessions each week. 5 units.* Dr. Alonso.
Stresses the interaction of societies and their geography, focusing primarily on the historic and current development of the United States. Consideration is given to technology, institutions, ideology, health, the economy, and other factors influencing the growth and shape of cities, their relations to each other and to rural areas.

POP 200a,b. Introduction to Population Sciences
Lectures. *Two 1-hour sessions each week. 2.5 units.* Dr. Ewbank, Members of the Department.
Reviews the basic interrelationships among fertility, mortality, and migration. Their interaction with social, cultural, and economic characteristics of societies is discussed for countries at each stage of the demographic transition, i.e., for both developed and developing countries. Introduces basic demographic concepts and methods, including age-sex pyramids, life tables, demographic rates, and kinds of surveys needed for collection of data.

POP 201a,b. Introductory Seminar on Population Sciences
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Ewbank, Members of the Department.
Supplements the introduction to population sciences presented in POP 200a,b. Most students will be concurrently enrolled in 200a,b. Topics include: basic physiology of human reproduction, contraceptive methods, population ethics, design of population programs, relationship between population growth and economic development, and contraceptive use in the United States. Several short papers will be required.
Prereq. Previous or concurrent enrollment in POP 200a,b.

POP 202c,d. Student Project Design Seminar
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Wyon, Members of the Department.
Oriented toward health and population problems of communities. Each student selects a community and an appropriate health or population problem. He/she presents a critical survey of the relevant literature and a project design, to amplify understanding of the relative frequency of the selected problem in relation to other health or population problems of the community, and to increase or test the available knowledge of causes of the problem.

POP 203c. Basic Demographic Methods
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Masnick, Dr. Ewbank.
Introduces the conceptual tools that are basic to any demographic analysis. Topics include: fertility rates, life tables, population projection, analysis of age structures, and the relationship between period and cohort data. It is expected that most students will continue on to POP 205d and/or POP 206d.

POP 204c,d. Biological Basis for Fertility Control
Lectures. *Two 1-hour sessions each week, with a third hour at the discretion of the instructor.*
Laboratory. *Six 2-hour sessions, to be arranged. 5 units.* Dr. Salhanick, Members of the Department.
Presents the fundamental physiology and biochemistry related to known and potential methods of family planning. Topics include: the biosynthesis, secretion, effects, and modes of action of the gonadal and gonadotropic hormones; and the relationship of the natural steroid hormones to synthetic analogues is also discussed. Laboratory sessions include demonstrations of a family planning clinic, an infertility unit, and procedures for sterilization and pregnancy termination.
Prereq. POP 200a,b and appropriate science background.

POP 205d. Population Analysis in Developing Countries
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Ewbank.
Presents the basic methods for demographic analysis of populations in developing countries. Includes techniques for estimating fertility and mortality rates in the absence of reliable vital statistics; survey approaches to intensive study of small areas, including analysis of birth intervals, mortality patterns, and migration streams; and an introduction to the measurement of the impact of family planning and health programs.
Prereq. POP 203c.

POP 206d. Population Analysis in the United States
Lectures. *Two 1½-hour sessions each week. 2.5 units.* Dr. Masnick.
Introduces the data and techniques for population analysis as a part of planning and evaluation in health and social service professions. Different population units are examined with focus on the consequences of change in population structure for service delivery. Cases include local community hospital bed needs, rapid population change in an exurban area, changing composition of an urban population, forecasting the Boston area population, among others.

POP 207a,b. Essentials of Human Reproduction
Lectures. *Two 1-hour sessions each week.*
Laboratory. *One 2-hour session each week. 5 units.* Dr. Berggren, Dr. Holtrop.
Designed for non-physicians to review key facets of human reproduction. Considers basic and applied aspects of embryology, anatomy, physiology, endocrinology and genetics. Lectures and laboratory exercises are supplemented by required readings. Special attention is directed to sexual behavior as it relates to reproduction and contraception. Field methods to assess reproductive functions are reviewed. A background in biology is desirable.

POP 209a,b. Foundations of Agricultural Sciences (Biology 195)
Lectures, seminars. *Two 1½-hour sessions each week. 5 units.* Dr. Levins.
Examines patterns of world food production as it develops from the interaction of social and biological systems: evolution of agro-ecosystems, principles of plant growth and productivity, pests and diseases, ecology of farming systems, consequences of technical choices, issues of agricultural change, and research strategies.
Prereq. Course in biology or permission of the instructor.

POP 209c,d. Population Biology
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Lewontin, Dr. Levins.
Approaches population studies from a general biological standpoint. Attempts to integrate population and community ecology, population genetics, and biogeography. Topics include: the structure of the environment in space and time and its interaction with organisms, simple single-species growth dynamics, age-dependent demography, two-species interactions, multiple-species community dynamics, evolution of the niche, elements of population genetics, and topics in biogeography.
Prereq. College courses in calculus and biology.

POP 212a,b. An Economic Approach to Population Policy
Lectures. *One 2-hour session each week, with a third hour at the discretion of the instructor. 5 units.* Dr. Repetto.
Presents the economics relevant to the formulation and evaluation of population policies in developing countries and surveys knowledge about the effectiveness of intervention strategies. Covers welfare economics of population policies; interactions between fertility and economic development; the impact on population growth of policies which affect incomes, education, survivorship, old-age security, and related variables, as well as conventional family planning programs.
Prereq. POP 200a,b and HPM-HSA 205a,b or equivalent.

POP 214c,d. The Biological Determinants of Fecundity, Environmental Factors, and Population Growth
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Frisch.
Deals with the direct effect of environmental factors such as nutrition on population growth, through the effects on age of menarche, age of male maturation, length of adolescent subfertility, lactational amenorrhea, pregnancy wastage, and age of menopause. Contemporary and historical data on these biological factors from different cultures will be considered, as well as their interactions with social customs.

POP 216c,d. Comparative Analysis of Public Policies in Developing Countries (Government 211)
Lectures, seminars, workshops. *One 2-hour session each week. 5 units.* Dr. John D. Montgomery (Professor of Public Administration, John F. Kennedy School of Government).
Examines patterns of policy making across cultures and issue areas, including interactions between policies and social contexts. Surveys Third World policies for dealing with such problems as population (fertility and migration); malnutrition; land reform; and management of large-scale irrigation systems. Applies the policy sciences approach to the formulation and implementation of large-scale programs of public intervention in social processes.

POP 217b. Introduction to Community Diagnosis of Birth and Death Rates in Developing Countries
Lectures, discussions. *One 2-hour session each week. 1.25 units.* Dr. Wyon.
Helps students distinguish within communities those kinds of persons at high risk of serious illness, death, and unwanted births. It uses data from studies at national and local levels to trace underlying causes of these events as the basis for designing feasible, effective, and simple preventive measures. Provides foundation for POP 202c,d and for other health and population courses considering policies and programs.
Prereq. Introductory courses in biostatistics, epidemiology, and (preferably) population sciences.

POP 220d. Human Ecology
Lectures, seminars. *Two 1-hour sessions each week. 1.25 units.* Dr. Levins.
Provides a broad overview of the human ecosystem as it emerges out of, but is different from, pre-human ecology. For each area of ecology, general principles will first be considered followed by examples from different human societies. Also considers the role of knowledge and conscious planning as an aspect of human ecology and examines approaches toward the solution of ecological problems.
Prereq. Assumes basic knowledge of biology.

HPM-HSA-POP 262c,d. Health Planning in Developing Countries
Lectures, seminars. *One 2-hour session each week.*
Laboratory. *One 1-hour session each week* (optional). *2.5 units.* Dr. Cash, Mr. Hsiao, Dr. Shepard.
(Course described under Health Policy and Management.)

POP-HPM-HSA 263c, 263d. The Design and Management of Population Programs (formerly **POP-HSA-HPM 235c,d**)
Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units each period.* Dr. G. Berggren, Dr. Wray, Dr. Ewbank, Dr. Wyon, Members of the Department.
Addresses, from a managerial perspective, the problems of developing and implementing population programs in Third World nations.

Problems are examined from the level of the community, the program manager, and the national development planner. Topics covered primarily through case studies based on family planning, health, nutrition, and rural development programs. The 'c' period stresses programs at the community and regional levels. The 'd' period is devoted to management of population programs in the context of national development.

POP 285a,b. Applied Mathematical Demography Seminar (Sociology 285)
Seminars. *One 2-hour session each week. 5 units.* Dr. Keyfitz.
Consists of research on the topics of POP 185a,b.
Enrollment subject to approval of the instructor.

POP 286c,d. Formal Models of Movement (Sociology 235)
Seminars. *One 2-hour session each week; additional individual consultations to be arranged. 5 units.* Dr. Alonso.
Reviews a broad variety of models of movement of populations and other types of movement, from the social sciences and possibly from the natural sciences. A detailed examination of the structure, assumptions, and uses of these models is presented. An effort is made to place them within a common theoretical structure and to compare their assumptions and implications.

POP 300. Tutorial Programs
Time and credit to be arranged.
Students at the master's level may make arrangements for tutorial work and special reading on topics related to population problems. There may be an opportunity to consider the design of studies, programs, or analysis of data.

POP 330e. Field Studies
During the week between the fall and spring semesters and/or a week at the end of the academic year. Dr. G. Berggren, Dr. W. Berggren.

Field Trip to Haiti
The objective of this field study is to provide exposure to the urban, rural, and development problems of a developing country. Students visit the homes of rural farmers to observe the living conditions of these families and their accessibility to health care facilities and programs. Students also see rural health centers, health surveillance teams, nutrition programs, and the headquarters of various health programs. What has been observed, how it relates to data previously collected, and what programs can be developed to improve the conditions are then discussed with the group's leaders and with local health planners.
Enrollment limited to 10 and subject to approval of the instructors.

Field Trip to the Dominican Republic
The objective of this field trip is very similar to that above; however, greater emphasis is placed upon family planning problems and programs in the Dominican Republic. Students will visit health centers, maternal and child health and family planning programs, and the headquarters of various health programs. These observations form the basis of discussions between the students, group leaders, and local health planners about what is being done and what can be done to solve the problems. Mr. Luis Gonzalez, an alumnus of the School and Head of Family Planning in the Dominican Republic, is the host for this visit.
Enrollment limited to 6 and subject to approval of the instructors.
Note: One or both of these field trips may be made available during an academic year.

POP 350-355. Research
Time and credit to be arranged.
Candidates for doctoral degrees may undertake research in the Department or may integrate research in population sciences with a doctoral program in another department or at the Center for Population Studies.
Members of the Department and of the Center for Population Studies are currently engaged in research in the following areas:

350 *Field studies and programs*
Dr. Wyon, Dr. Guerrero, Dr. G. Berggren, Dr. W. Berggren.

351 *Biomedicine and reproductive physiology*
Dr. Salhanick.

352 *Demography*
Dr. Keyfitz.

353 *Population ethics*
Dr. Dyck, Dr. Potter.

354 *Population economics*
Dr. Repetto.

355 *Complex systems*
Dr. Levins.

The following courses, offered by other faculties of Harvard University, are among those that may be of particular interest to students of population sciences. They are open to qualified students from the School of Public Health.

Ethics 284. Seminar: Ethical Aspects of Population Policy
Half course *(spring term). Hours to be arranged.* Dyck.

Sociology 251. Seminar: Social Policy and Population Issues in the Developed Countries
Half course (*spring term*). *M., 2-4.* Alonso.
A broad range of issues in the developed countries, including education, health, housing, social security, status of women, labor policy, racial and group prejudice, are affected by declining fertility, growing up of the baby boom generation, and international migration. Stresses social processes involved and the policy responses proposed and tried out. (Offered in the Faculty of Arts and Sciences.)

Sanitary Engineering

ENG SCI 171. Chemistry of the Aqueous Environment
Half course (*fall term*). *M., W., F., at 1.* Professor Butler.
Chemical principles applicable to environmental science and engineering. Emphasis on pH, complex formation, and solubility in multicomponent systems. Sources, occurrence, and chemical reactions of important constituents in natural waters. Natural aquatic cycles and their disruption by human activity. Processes affecting the fate of toxic chemicals in fresh water environments.
Prereq. CHEM 11 or equivalent.

ENG SCI 172. Hydrologic Cycles
Half course (*fall term*). *Tu., Th., 9:30-11.* Professor Wofsy.
Physical mechanisms which govern the movement of water over, under and on the earth. Water budgets, basin characteristics, groundwater transport, direct and indirect observational methods, sampling and network techniques, models of water bodies, quantitative and qualitative assessments of water resource systems.
Prereq. APPL MATH 21b and one year of college-level physics.

ENG SCI 173. Introduction to Environmental Microbiology
Half course (*spring term*). *M., W., (F.), at 11, and laboratory hours to be arranged.* Professor Mitchell.
Introduction to the ecology of microorganisms. Emphasis on microorganisms as functioning members of ecosystems. Critical examination of the role of microorganisms in water pollution, water-borne diseases, biological control, and water purification.
Prereq. BIO 1 or BIO 19.

ENG SCI 175. Introduction to Environmental Engineering
Half course (*spring term*). *Tu., Th., 11-12:30.* Professors Rogers and Harrington.
To be given 1981-82. Offered alternate years.
Introduces engineering technologies for control of the environment and relates to underlying scientific principles. Efficient designs of environmental management facilities and systems. Cases from aquatic, terrestrial and atmospheric environments will be discussed. For graduates without background in environmental engineering. Prereq. Any two of ENG SCI 171, 172, or 173, which may be taken concurrently. APPL MATH 21a and 21b or equivalent mathematical background.

ENG 250. Design of Water Resource Systems
Half course (*fall term*). *Tu., Th., 9:30-11.* Professor Thomas.
Principles of engineering and economic analysis applied to water resource systems. Functional design of management systems for collection, storage, conveyance, treatment, and distribution of water. Uses techniques of operations research to develop methods for planning integrated systems of dams, reservoirs, canals, pipe networks, and treatment plants. Applications in water supply, irrigation, hydropower, environmental protection, and conservation of wildlife.
Prereq. APPL MATH 105a; ENG SCI 121, 123 or equivalents.

ENG SCI 251. Seminar: Technology Choice in Water Resources Development
Half course (*spring term*). *Hours to be arranged.* Professor Rogers.
Not given 1981-82.
Discusses the technology available for water resources development. Relates the characteristics of the technology to methods for evaluating technology choice. Focuses upon water supply and delivery systems and hydropower facilities. Emphasis on applications in developing countries.

ENG 253. Stochastic Processes in Environmental Engineering
Half course *(fall term). Hours to be arranged.* Professor Fiering.
To be given 1981-82. Offered alternate years.
Theory and application of statistical methods in estimation of hydrologic extremes; spectral analysis; flow synthesis, theory of storage, robust estimation techniques, runoff and groundwater models.
Prereq. ENG SCI 118 and 172, or equivalent preparation in statistics and hydrology.

ENG 257. Seminar: Models for Environmental Systems Planning
Half course *(throughout the year). Tu., 12-2.* Professor Rogers.
Critical evaluation of current systems applications; biology and chemistry in environmental science, with emphasis on models for the analysis of water quality standards, optimality, and resilience in water-resource systems. Papers and presentations are required. Students intending to enroll should meet with the instructor to arrange scheduling before study cards are due.

ENG 270. Engineering Systems for Environmental Control
Half course (*spring term*). *M., W., F., at 10.* Professor Harrington.
Offered alternate years.
Provision of urban water; engineering aspects of the collection and disposal of spent water and solid wastes; significant interchanges between the gaseous, liquid, and solid phases of the environment; geographic interchanges; time-dependent developments. Data collection and processing for monitoring and control; maintenance and operation of pollution control systems.
Prereq. ENG SCI 123 or permission of instructor.

ENG 272. Water Quality and Its Management
Half course (*fall term*). *Tu., Th., 11-12:30.* Professor Morris.
Nature, sources, and effects of inorganic and organic impurities in natural waters. Water quality standards. Effects of contaminating and polluting discharges on water quality. Natural purification of surface waters. Chemical and biochemical transformations in lakes and rivers.
Prereq. ENG SCI 171 and 173.

ENG 273. Water Pollution Microbiology
Half course (*fall term*). *M., W., 2-2:30.* Professor Mitchell.
To be given 1981-82.
Advanced discussion of the role of microorganisms as both pollutants and purifying agents. Particular attention to ecological approaches to pollution control. Eutrophication, microbial imbalance, pesticides, stream purification, and a critical discussion of current waste treatment methods.
Prereq. ENG SCI 173 or equivalent.

ENG 274. Chemical Models of Natural and Polluted Waters
Half course (*spring term*). *Tu., Th., 1-2:30.* Professor Butler.
Offered alternate years.
Chemical aspects of aqueous environmental systems. Mathematical models include thermodynamic, kinetic, biological, and hydrodynamic processes. Applications to water quality management, pollution control, limnology, oceanography, and geology.
Prereq. Physical chemistry (e.g., CHEM 11, ENG SCI 171) and some experience with biology and geology.

ENG 276. Treatment of Water Supplies and Wastewaters
Half course *(spring term). Tu., Th., 11-12:30.* Professor Morris.
Quality standards for water supplies. Processing of natural water for municipal use, including coagulation, softening, deferrization, disinfection, adsorption, and demineralization. Physical, chemical, and biological treatment of wastewaters, including "advanced" methods.
Prereq. ENG SCI 171 or permission of instructor.

Tropical Public Health

TPH 201a. Ecology, Epidemiology, and Control of Important Parasitic and Viral Diseases of Developing Areas
Lectures, seminars, demonstrations. *Four 1-hour sessions each week. 3 units.* Dr. Weller, Members of the Department.
Provides an introduction to ecological and epidemiologic concepts basic to the control of infectious agents. Considers important parasitic and viral diseases of particular significance in the developing areas of the world. Epidemiologic principles of vector-associated diseases are elucidated through study of entities such as malaria and schistosomiasis. Prior knowledge of the pathogenesis of disease produced by infectious agents is desirable.

TPH 203d. Perspectives in Tropical Health: The Background for Decision Analysis
Lectures, conferences. *One 2-hour session each week. 1 unit.* Dr. Weller, Guest Lecturers.
Provides background information on environmental, social, economic, and political factors that influence health programs in the tropics. At each session a distinguished guest lecturer covers an assigned topic, including subjects such as the development of professional education, problems of agriculture, nutrition, and water supply, and the political background of international cooperation. Each presentation followed by informal student discussion.
Enrollment open to all students.

TPH 204c. Introduction to the Techniques of Investigation of Parasitic Infections
Lectures, laboratory, seminars. *Two 3-hour sessions each week. One 2-hour additional laboratory session each week, to be arranged. 5 units.* Dr. Pan, Dr. Coolidge, Dr. Hoff.
Emphasizes laboratory methods for the study of parasitic diseases of public health importance. Provides exposure to theory and application techniques essential to epidemiologic and laboratory investigation. Life cycles of several parasites maintained and examined with respect to detection and quantification of infection, immunity, and control.
Enrollment limited to 15 and subject to approval of the instructors. Preference given to concentrators in tropical public health and microbiology.

TPH 205c. Clinical and Pathologic Features of Tropical Diseases
Case presentations, clinico-pathologic conferences, demonstrations. *One 2-hour session each week. 1 unit.* Dr. Weller, Dr. Coolidge, Dr. Boyer, Dr. Dammin, Dr. Franz von Lichtenberg (Professor of Pathology, Harvard Medical School), Members of the Department.
Designed for students particularly interested in tropical medicine. Emphasis is on the clinico-pathologic aspects of tropical diseases. At each session disease entities are introduced by presenting a clinical case, and pertinent clinical and pathologic features of the disease are then reviewed.
Enrollment subject to approval of the instructors.

TPH 206d. Principles of Vector Biology
Lectures, laboratories, seminars, field trips. *Three 1-hour sessions and two 2-hour sessions each week. 5 units.* Dr. Michelson, Dr. Spielman.
The manner in which arthropods and molluscs transmit disease and the principles of vector control are discussed from ecological, physiological, and genetic points of view. Class sessions introduce concepts and techniques currently employed in controlling vector-borne disease. Weekend field trips provide an opportunity for students to apply skills acquired in the classroom.
Prereq. TPH 201a or suitable biology background, and permission of the instructors.

TPH 208d. Epidemiology and Control of Schistosomiasis
Seminars, laboratory exercises. *One 3-hour session each week. 2 units.* Dr. Michelson, Dr. Chernin, Dr. Pan, Dr. Weller.
Alternates yearly with TPH 210d; 1981-82.
The problems posed by schistosomiasis as an expanding health hazard are presented in a series of seminars and laboratory exercises. Emphasis is given to the biology of snail vectors, to problems of assessment of significance of the disease, and to the potentials of various approaches to control. Opportunity to become familiar with appropriate techniques is afforded in the laboratory.
Prereq. TPH 201a or permission of the instructors.

TPH 210d. Current Problems in Malariology
Seminars, laboratory exercises. *One 3-hour session each week. 2 units.* Dr. Chernin, Dr. Spielman, Dr. Weller, Members of the Department. Alternates yearly with TPH 208d; 1980-81.
Supplements the subject material on malaria offered in TPH 201a and TPH 204c. Particular attention is given to problems now encountered in eradication and control programs. In the laboratory, experience is provided with procedures essential to the epidemiologic investigation of malaria.
Prereq. TPH 201a and permission of the instructors.

TPH 218d. Introduction to the Immunology of Parasitic Diseases
Lectures, discussions. *One 2-hour session each week. 1.25 units.* Dr. Boyer, Guest Lecturers.
Provides an introduction to the immunology of parasitic diseases for students with a basic knowledge of immunology. Includes the general principles of immunology relating to the host-parasite relationship and the immunological aspects of selected parasitic diseases.
Prereq. Suitable course in basic immunology.

TPH 300a,b,c,d,e. Tutorial Programs
Laboratory exercises. *Time and credit to be arranged.*
Individual work for candidates at the master's degree level may be carried out under supervision of a member of the Department. Various parasites of medical importance are maintained and are available for studies on metabolism, host-parasite relationships, and chemotherapy. Arrangements subject to approval of the instructor.

TPH 350. Research
Doctoral candidates or qualified full-time special students may undertake original investigations in the laboratory or in the field by arrangement with the Head of the Department. Members of the Department are currently engaged in the following areas of research:

351 *Tissue culture and immunological techniques as applied to problems in medical virology*
Dr. Weller.

352 *Cultivation* in vitro *of parasitic helminths, protozoa, and other invertebrates of medical importance*
Dr. Weller, Dr. Chernin, Dr. Pan.

353 *Biology, host-parasite relationships, and control of molluscan vectors of schistosomiasis and of other parasitic infections*
Dr. Chernin, Dr. Michelson, Dr. Pan.

354 *Population genetics, nutrition, and reproduction of medically important arthropods*
Dr. Spielman.

355 *Arthropod transmission of viral, protozoan, and helminthic agents*
Dr. Spielman.

356 *Immunology of schistosomiasis*
Dr. Boyer, Dr. Weller.

357 *Epidemiology of Chagas' disease and schistosomiasis in rural Brazil*
Dr. Hoff.

358 *Mechanisms of health care in rural Haiti*
Dr. Berggren.

After delivering a seminar on "The Primary Health Care Strategy for Ghana," Dr. Richard Morrow (left) of the World Health Organization joins the discussion with Dr. Wray of the Office of International Health Programs.

Postdoctoral Fellows, Ton Schoot Uiterkamp, Resha Putzrath, Dilip Ahuja, Jane Warren, and Susan Jaken (left to right, counter-clockwise) discuss objectives of Interdisciplinary Programs in Health with Dr. Little (right foreground).

Officers of Instruction and Research

Members of the Faculty

William Alonso, A.B., M.C.P (Harvard University); Ph.D. (University of Pennsylvania), Richard Saltonstall Professor of Population Policy.

Mary Ochsenhirt Amdur, S.B. (University of Pittsburgh); Ph.D. (Cornell University), Associate Professor of Toxicology (*Physiology*); *Lecturer, Massachusetts Institute of Technology.*

Harry Nicholas Antoniades, B.S., Ph.D. (Athens University, Greece), Associate Professor of Biochemistry (*Nutrition*); *Senior Investigator, Blood Research Institute, Inc., Boston.*

James Edward Austin, A.A. (Flint Community Junior College); B.B.A. (University of Michigan); M.B.A., D.B.A. (Harvard University), Lecturer on Nutrition Policy and Programs (*Nutrition*); *Professor of Business Administration, Harvard Business School.*

John Christian Bailar, III, A.B. (University of Colorado); M.D. (Yale University); Ph.D. (American University), Lecturer on Biostatistics; *Editor-in-Chief, Journal of the National Cancer Institute, NIH, Bethesda, MD.*

Edward Lamar Baker, Jr., A.B. (Vanderbilt University); M.D. (Baylor College of Medicine); M.P.H., S.M. in Phys. (Harvard University), Assistant Professor of Occupational Medicine (*Physiology*).

Kenneth Paul Barclay, A.B. (Tufts University); M.B.A. (University of Massachusetts, Amherst), Member of the Faculty of Public Health, Associate Dean for Administration.

Diana Barrett, A.B. (Sweet Briar College); S.M. (Boston University); M.B.A., D.B.A. (Harvard University), Assistant Professor of Management (*Health Policy and Management*).

Colin Banks Begg, B.Sc., Ph.D. (Glasgow University), Assistant Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute.*

Robert Charles Benfari, A.B. (Colby College); M.B.A. (Babson Institute); Ph.D. (Yeshiva University); S.M. in Hyg. (Harvard University), Associate Professor of Psychology (*Behavioral Sciences*).

Gretchen Mary Berggren, A.B. (Nebraska State College); M.D. (University of Nebraska); S.M. in Hyg. (Harvard University), Assistant Professor of Population Sciences.

Warren Lee Berggren, S.B., M.D. (University of Nebraska); M.P.H., Dr.P.H. (Harvard University), Associate Professor of Tropical Public Health and Population Sciences.

Bengt Erik Bjarngard, M.Sc., D.Sc. (University of Lund, Sweden), Lecturer on Medical Radiation Physics (*Environmental Health Sciences*); *Associate Professor of Radiation Therapy, Harvard Medical School.*

Konrad Emil Bloch, Ph.D. (Columbia University), Professor of Science (*Nutrition*) in the Faculty of Public Health and Higgins Professor of Biochemistry in the Faculty of Arts and Sciences.

Elkan Rogers Blout, A.B. (Princeton University); Ph.D. (Columbia University), Member of the Faculty of Public Health; Dean for Academic Affairs (*Edward S. Harkness Professor of Biological Chemistry, Harvard Medical School*).

Leslie Irvin Boden, A.B. (Brandeis University); Ph.D. (Massachusetts Institute of Technology), Assistant Professor of Economics (*Physiology and Health Policy and Management*).

Markley Holmes Boyer, A.B. (Princeton University); M.D. (University of Pennsylvania); D.Phil. (Magdalen College, Oxford University); M.P.H. (Harvard University), Assistant Professor of Tropical Public Health.

Joseph David Brain, A.B. (Taylor University); S.M., S.M. in Hyg., S.D. in Hyg. (Harvard University), Professor of Physiology.

Peter Braun, S.B. (Yale University); M.D. (Columbia University), Lecturer on Public Health (*Health Policy and Management*).

J. Larry Brown, A.B. (Anderson College), A.M. (University of California, Los Angeles), M.S.W., Ph.D. (Brandeis University), Lecturer on Health Services (*Health Policy and Management*), Director of Cooperative Health Improvement Program.

William Alfred Burgess, S.B. (Tufts University); S.M. (Harvard University), Associate Professor of Occupational Health Engineering (*Environmental Health Sciences*); *Corporate Manager of Industrial Hygiene, Polaroid Corp.*

James Preston Butler, A.B. (Pomona College); A.M., Ph.D. (Harvard University), Assistant Professor of Biomathematics (*Physiology*).

John Cairns, M.D., B.A., B.M.,B.Ch., D.M. (Oxford University), Professor of Microbiology.

Richard Alan Cash, S.B. (University of Wisconsin); M.D. (New York University); M.P.H. (The Johns Hopkins University), Lecturer on Tropical Public Health; *Institute Fellow, Harvard Institute for International Development.*

Jan Cerny, M.D. (Charles University Medical School, Prague); Ph.D. (Czechoslovakia Academy of Sciences Institute of Experiment Biology and Genetics, Prague), Associate Professor of Immunology (*Microbiology*).

Eli Chernin, S.B. (College of City of New York); A.M. (University of Michigan); S.D. (The Johns Hopkins University), Professor of Tropical Public Health.

Catherine Coolidge, A.B. (Radcliffe College); M.D. (The Johns Hopkins University); M.P.H. (Harvard University), Lecturer on Tropical Public Health.

Douglas Winslow Cooper, A.B. (Cornell University); S.M. (Pennsylvania State University); Ph.D. (Harvard University), Assistant Professor of Environmental Physics (*Environmental Health Sciences*).

William George Costello, S.B. (Tufts University); S.M., Ph.D. (Cornell University), Assistant Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute.*

Allen Latham Cudworth, B.E.E. (University of Alabama); M.E.E. (Massachusetts Institute of Technology); S.D. in Hyg. (Harvard University), Lecturer on Applied Acoustics and Environmental Health (*Environmental Health Sciences*); *Vice President of Liberty Mutual Insurance Company and Director, Hopkinton Research Center.*

William John Curran, J.D. (Boston College); LL.M., S.M. in Hyg. (Harvard University), Frances Glessner Lee Professor of Legal Medicine in the Faculty of Medicine and the Faculty of Public Health (*Health Policy and Management* and *Maternal and Child Health and Aging*).

Richard Henry Daggy, S.B, S.M., Ph.D. (University of Minnesota); M.P.H., Dr.P.H. (Harvard University), Lecturer on Tropical Public Health.

Richard Dennis, S.B. (Northeastern University); S.M. (Harvard University), Associate Professor of Applied Environmental Health Engineering (*Environmental Health Sciences*); *Director, Pollution Control Laboratory, G.C.A. Corporation, Bedford.*

Eva Yona Deykin, A.B. (Radcliffe College); S.M. (Simmons College); M.P.H., Dr.P.H. (Harvard University), Assistant Professor of Social Work (*Maternal and Child Health and Aging*).

Jeffrey Mark Drazen, S.B. (Tufts University); M.D. (Harvard University), Assistant Professor of Physiology; *Assistant Professor of Medicine, Harvard Medical School.*

Margaret Elizabeth Drolette, A.B. (Radcliffe College); M.P.H., Ph.D. (Harvard University), Professor of Biostatistics.

Johanna Todd Dwyer, S.B. (Cornell University); S.M. (University of Wisconsin); S.M. in Hyg., S.D. in Hyg. (Harvard University), Lecturer on Maternal and Child Health Nutrition (*Maternal and Child Health and Aging*); *Director, Stern Nutrition Center, Tufts Medical Center.*

Arthur James Dyck, A.B. (Tabor College); A.M. (University of Kansas); Ph.D. (Harvard University), Mary B. Saltonstall Professor of Population Ethics; *Member of the Faculty of the Harvard Divinity School.*

Diane Douglas Eardley, A.B., Ph.D. (University of California at Berkeley), Assistant Professor of Immunology (*Microbiology*).

Eric Eisenstadt, A.B., Ph.D. (Washington University), Assistant Professor of Biology (*Physiology* and *Microbiology*).

Robert Curtis Ellison, S.B. (Davidson College); M.D. (Medical University of South Carolina); S.M. in Epid. (Harvard University), Lecturer on Epidemiology; *Associate Professor of Pediatrics, Harvard Medical School.*

Myron Elmer Essex, S.B. (University of Rhode Island); D.V.M., S.M. (Michigan State University); Ph.D. (University of California), Professor of Microbiology; *Scholar of the Leukemia Society of America, Inc.*

Douglas Ewbank, A.B. (Oberlin College); A.M., Ph.D. (Princeton University), Assistant Professor of Population Sciences.

James Joseph Feeney, A.B. (Dartmouth College); M.D. (Harvard University), Member of the Faculty of Public Health; *Director of the Medical Area Health Service.*

Henry Arthur Feldman, A.B. (Swarthmore College); A.M., Ph.D. (Harvard University), Assistant Professor of Applied Mathematics (*Physiology* and *Biostatistics*).

Penny Hollander Feldman, A.B. (Radcliffe College); A.M., Ph.D. (Harvard University), Assistant Professor of Political Science (*Health Policy and Management*).

Michael Lawrence Feldstein, B.A., M.Math. (University of Waterloo); Ph.D. (State University of New York at Buffalo), Assistant Professor of Biostatistics; *Biostatistician, The Children's Hospital Medical Center.*

Benjamin Greeley Ferris, Jr., A.B., M.D. (Harvard University), Professor of Environmental Health and Safety (*Physiology*); *Director of Environmental Health and Safety, University Health Services.*

Harvey Vernon Fineberg, A.B., M.D., M.P.P., Ph.D. (Harvard University), Associate Professor of Health Services Administration (*Health Policy and Management*).

Melvin William First, S.B. (Massachusetts Institute of Technology); S.M., S.D. (Harvard University), Professor of Environmental Health Engineering (*Environmental Health Sciences*).

Howard Stanley Frazier, Ph.B. (University of Chicago); M.D. (Harvard University), Director of the Center for the Analysis of Health Practices and Member of the Faculty of Public Health; *Professor of Medicine, Harvard Medical School.*

Rose Epstein Frisch, A.B. (Smith College); A.M. (Columbia University); Ph.D. (University of Wisconsin), Lecturer on Population Studies (*Population Sciences*).

Peter Gehr, Ph.D. (University of Berne), Visiting Assistant Professor of Pulmonary Biology (*Physiology*); *Biologist, University of Berne.*

Richard David Gelber, S.B. (Cornell University); S.M. (Stanford University); Ph.D. (Cornell University), Assistant Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute.*

Rebecca Sue Gelman, A.B. (University of Michigan); Ph.D. (State University of New York at Buffalo), Assistant Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute.*

Robert Pershing Geyer, S.B., S.M., Ph.D. (University of Wisconsin), Professor of Nutrition.

Steven Lawrence Gortmaker, A.B. (University of Michigan); S.M., Ph.D. (University of Wisconsin), Assistant Professor of Sociology (*Behavioral Sciences*).

Christopher Keith Grant, S.B., Ph.D. (University of London), Assistant Professor of Immunology (*Microbiology*).

William Frank Greenlee, S.B., S.M. (San Jose State University); Ph.D. (University of Rochester), Assistant Professor of Toxicology (*Physiology*).

Nancy Mueller Gutensohn, A.B. (Beloit College); S.M. in Epid., S.D. in Epid. (Harvard University), Assistant Professor of Epidemiology (*Epidemiology*).

David Alan Hamburg, A.B., M.D. (Indiana University, Professor of Psychiatry (*Behavioral Sciences* and *Health Policy and Management*) in the Faculty of Public Health and the Faculty of Medicine; Professor of Health Policy and Management in the Faculty of Government; *Chairman of the Division of Human Behavior* and *Health Policy, Department of Psychiatry, Harvard Medical School; Director of the Harvard University Division of Health Policy and Research.*

James Anthony Hanley, B.Sc., M.Sc. (National University of Ireland); Ph.D (University of Waterloo, Canada), Assistant Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute* (on leave 1980-81).

Joseph John Harrington, B.C.E. (Manhattan College); A.M., Ph.D. (Harvard University), Professor of Environmental Health Engineering (*Sanitary Engineering*) in the Faculty of Public Health and Gordon McKay Professor of Environmental Engineering in the Faculty of Arts and Sciences.

William Alan Haseltine, A.B. (University of California at Berkeley); Ph.D. (Harvard University), Associate Professor of Microbiology; *Associate Professor of Pathology, Harvard Medical School.*

Kenneth Cronise Hayes, A.B. (Wesleyan University); D.V.M. (Cornell University); Ph.D. (University of Connecticut), Associate Professor of Nutrition.

Maxine Delores Hayes, A.B. (Spelman College); M.D. (State University of New York at Buffalo); M.P.H. (Harvard University), Lecturer on Maternal and Child Health; *Executive Director/Medical Director, Hinds-Rankin Urban Health Innovations Project.*

David Hemenway, A.B. (Harvard University); A.M. (University of Michigan); Ph.D. (Harvard University), Assistant Professor of Political Economy (*Health Policy and Management*).

Manuel Guillermo Herrera-Acena, A.B., M.D. (Harvard University), Associate Professor of Medicine (*Nutrition*).

Regina Elbinger Herzlinger, S.B. (Massachusetts Institute of Technology); D.B.A. (Harvard University), Member of the Faculty of Public Health (*Health Policy and Management*); *Professor of Business Administration, Harvard Business School.*

Howard Haym Hiatt, M.D. (Harvard University), Dean of the Faculty of Public Health; *Professor of Medicine, Harvard Medical School.*

William Carson Hinds, B.M.E. (Cornell University); S.M. in Hyg., S.D. in Env. H. (Harvard University), Associate Professor of Environmental Health Engineering (*Environmental Health Sciences*).

Rodney Hoff, S.B. (University of Wisconsin); M.P.H. (University of North Carolina); S.M., S.D. in Tr.P.H. (Harvard University), Assistant Professor of Tropical Public Health.

Donald Frederick Hornig, S.B., Ph.D. (Harvard University), Professor of Chemistry in Public Health (*Physiology*); Director of Interdisciplinary Programs in Health.

William Ching-Lung Hsiao, A.B. (Ohio Wesleyan University); M.P.A. (Harvard University), Associate Professor of Economics (*Health Policy and Management*); *Member of the Faculty of Harvard Business School.*

Agnes Mayer Huber, B.Sc. (Oxford University, England); Ph.D. (Harvard University), Lecturer on Nutrition; *Director of Nutrition, Eunice Kennedy Shriver Center for Mental Retardation.*

George Barkley Hutchison, A.B., M.D., M.P.H. (Harvard University), Professor of Epidemiology.

Philip F. Judy, S.B., S.M., Ph.D. (University of Wisconsin), Lecturer on Medical Radiation Physics (*Environmental Health Sciences*); *Assistant Professor of Radiology, Harvard Medical School.*

Jack Kasten, S.B. (Michigan State University); M.P.H. (University of Michigan); J.D. (Boston College), Lecturer on Health Services Administration (*Health Policy and Management); Consultant, Arthur D. Little, Inc., Cambridge.*

Ann Randtke Kennedy, A.B. (Vassar College); S.M. in Env. H., S.D. in Phys. (Harvard University), Assistant Professor of Radiobiology (*Physiology*).

Ralph Leo Kent, Jr., A.B. (University of Notre Dame); S.M. in Bio., S.D. in Bio. (Harvard University), Lecturer on Biostatistics; *Assistant Staff Member, Forsyth Dental Center.*

Nathan Keyfitz, B.Sc. (McGill University); Ph.D. (University of Chicago), Andelot Professor of Sociology in the Faculty of Arts and Sciences and of Demography in the Faculty of Public Health (*Population Sciences*).

William Monroe Keyserling, B.I.E. (Georgia Institute of Technology). S.M.E., S.M., Ph.D. (University of Michigan); Assistant Professor of Occupational Safety (*Environmental Health Sciences* and *Physiology*).

Richard Clark Killin, A.B. (University of Arizona); LL.B. (University of Michigan), Member of the Faculty of Public Health; Special Assistant to the Dean.

Stephen William Lagakos, S.B. (Carnegie-Mellon University); M.Phil., Ph.D. (George Washington University), Associate Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute.*

Nan Laird, S.B. (University of Georgia); Ph.D. (Harvard University), Assistant Professor of Biostatistics.

Philip Todd Lavin, A.B. (University of Rochester); Ph.D. (Brown University), Assistant Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute.*

David Evan Leith, A.B. (Lehigh University); M.D. (Harvard University), Associate Professor of Physiology.

David Hugh Leith, S.B., S.M. in Ch.E. (University of Cincinnati); S.D. in Env. H. (Harvard University), Assistant Professor of Environmental Health Engineering (*Environmental Health Sciences*).

C. Robin LeSueur, B.A., B.S.W. (University of Toronto); M.L.S. (Columbia University), Member of the Faculty of Public Health and the Faculty of Medicine; *Librarian in the Francis A. Countway Library of Medicine.*

Richard Levins, A.B. (Cornell University); Ph.D. (Columbia University), John Rock Professor of Population Sciences.

Howard Jules Levy, S.B., S.M., M.B.A. (Rensselaer Polytechnic Institute), Member of the Faculty of Public Health; Associate Dean for Finance and Operations.

Richard Charles Lewontin, A.B. (Harvard University); A.M., Ph.D. (Columbia University), Member of the Faculty of Public Health (*Population Sciences*); *Alexander Agassiz Professor of Zoology, Harvard University.*

John Bertram Little, A.B. (Harvard University); M.D. (Boston University), Professor of Radiobiology (*Physiology*).

Thomas Arthur Louis, A.B. (Dartmouth College); Ph.D. (Columbia University), Associate Professor of Biostatistics.

Bernard Lown, S.B. (University of Maine); M.D. (The Johns Hopkins University), Professor of Cardiology in Nutrition.

Mohamed Sayed el Lozy, M.B.,B.Ch. (University of Cairo); M.D., Ph.D. (University of Alexandria), Assistant Professor of Nutrition.

John Morrison MacIntyre, S.B., Ph.D. (Massachusetts Institute of Technology), Assistant Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute.*

Brian MacMahon, M.D., D.P.H., Ph.D. (University of Birmingham, England); S.M. in Hyg. (Harvard University), Henry Pickering Walcott Professor of Epidemiology.

Morton Abraham Madoff, A.B., M.D. (Tulane University); M.P.H. (Harvard University), Lecturer on Applied Microbiology; *Professor of Community Medicine, Tufts University School of Medicine.*

George Stephen Masnick, A.B., A.M. (Cornell University); Ph.D. (Brown University), Associate Professor of Demography (*Population Sciences* and *Behavioral Sciences*).

Alfred Lee McAlister, A.B. (University of Texas at Austin); Ph.D. (Stanford University), Assistant Professor of Behavioral Sciences.

William Edward McAuliffe, A.B. (The Johns Hopkins University); A.M. (Washington University); Ph.D. (The Johns Hopkins University), Associate Professor of Sociology (*Behavioral Sciences*).

Colquitt Meacham, A.B. (Salem College); LL.B. (Emory University); LL.M. (Harvard University), Member of the Faculty of Public Health; Associate Dean for Student and Alumni Affairs.

Jere Mead, S.B., M.D. (Harvard University), Cecil K. and Philip Drinker Professor of Environmental Physiology (*Physiology*).

Cyrus Rustam Mehta, B.Tech. (Indiana Institute of Technology), S.M., Ph.D. (Massachusetts Institute of Technology), Assistant Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute.*

Charles Marie Joseph Mertens de Wilmers, M.D., Lic. en Psych. (Catholic University of Louvain, Belgium), Visiting Professor of Psychiatry (*Behavioral Sciences*); *Professor of Medical Psychology, Faculty of Medicine, Catholic University of Louvain.*

Edward Harlan Michelson, S.B., S.M. (University of Florida); Ph.D. (Harvard University), Associate Professor of Tropical Public Health.

Olli Sakari Miettinen, M.D. (University of Helsinki); , M.P.H., M.Sc., Ph.D. (University of Minnesota), Professor of Epidemiology and Biostatistics.

Farrokh Ziaollah Modabber, A.M., Ph.D. (University of California, Los Angeles), Lecturer on Microbiology; *Associate Professor of Immunobiology, University of Teheran School of Public Health.*

Dade William Moeller, S.B., S.M. (Georgia Institute of Technology); Ph.D. (North Carolina State College), Professor of Engineering in Environmental Health; Associate Director, Kresge Center for Environmental Health.

Richard Redding Monson, S.B. (North Dakota State University); M.D., S.M. in Hyg., S.D. in Hyg. (Harvard University), Associate Professor of Epidemiology.

Jose Obdulio Mora, M.D. (National University of Columbia); S.M. in Nutr. (Harvard University), Assistant Professor of Nutrition.

John Carrell Morris, S.B. (Rutgers University); A.M., Ph.D. (Princeton University); A.M. (hon.) (Harvard University), Gordon McKay Professor of Sanitary Chemistry (*Sanitary Engineering*).

Alan Sydney Morrison, A.B. (Harvard University); M.D. (Tufts University); S.M. in Hyg., S.D. in Epid. (Harvard University), Associate Professor of Epidemiology.

C. Frederick Mosteller, S.B., S.M. (Carnegie Institute of Technology); A.M., Ph.D. (Princeton University), S.D. (hon.) (University of Chicago); S.D. (hon.) (Carnegie-Mellon University), Roger Irving Lee Professor of Mathematical Statistics (*Biostatistics*); *Professor of Mathematical Statistics in the Faculty of Arts and Sciences; Member of the Faculty of Medicine, Harvard Medical School* (on leave 1980-81).

Raymond Leo Harrington Murphy, Jr., S.B. (College of the Holy Cross); M.D. (New York University); M.P.H., S.D. in Hyg. (Harvard University), Lecturer on Occupational Medicine (*Physiology*); *Director, Pulmonary Service, Faulkner Hospital.*

Raymond Kenneth Neff, A.B. (Dartmouth College); S.M. in Bio., S.D. in Bio. (Harvard University), Assistant Professor of Biostatistics; *Director, Health Sciences Computing Facility.*

H. Richard Nesson, A.B. (Harvard University); M.D. (Boston University), Associate Professor of Health Services; Director, Office of Extramural Health Programs; *Associate Professor of Medicine, Harvard Medical School; Director of Ambulatory Services, Peter Bent Brigham Hospital.*

Roger Loyd Nichols, A.B. (Cornell College); M.D. (University of Iowa); A.M. (hon.) (Harvard University), Irene Heinz Given Professor of Microbiology; Associate Director, Center for the Prevention of Infectious Diseases.

Peter Ofner, B.Sc. (University of London), A.R.I.C. (Associate of Royal Institute of Chemistry of Great Britain and Northern Ireland), Ph.D. (University of London), Lecturer on Toxicology (*Physiology*); *Director, Steroid Biochemistry Laboratory, Shattuck Hospital.*

Marcello Pagano, B.Sc. (University of Cape Town); S.M. (University of Florida); Ph.D. (The Johns Hopkins University), Associate Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute.*

Ruth Heather Palmer, B.A., M.D. (Cambridge University, England); S.M. in H.S.Ad. (Harvard University), Assistant Professor of Health Services (*Health Policy and Management*).

Steve Chia-Tung Pan, B.S. (Tokyo Jikeikai Premedical College); M.D. (Tokyo Jikeikai Medical College); M.P.H. (Harvard University), Professor of Tropical Public Health.

John Milton Peters, S.B., M.D. (University of Utah); M.P.H., S.D. in Hyg.(Harvard University), Professor of Occupational Medicine (*Physiology*); Director of the Educational Resource Center for Occupational Health and Safety (on leave 1980-81).

Susan Radius, A.B. (Vassar College); M.Ed. (Goucher College); Ph.D. (The Johns Hopkins University), Assistant Professor of Sociology (*Behavioral Sciences*) (on leave 1980-81).

Robert Balentine Reed, A.B. (The Johns Hopkins University); A.M., Ph.D. (University of Chicago); A.M. (hon.) (Harvard University), Professor of Biostatistics (*Health Policy and Management* and *Maternal and Child Health and Aging*).

Robert Copeland Repetto, A.B. (Harvard University); M.Sc. (London School of Economics); Ph.D. (Harvard University), Associate Professor of Economics and Population (*Population Sciences*).

Richard Jennings Reynolds, A.B. (University of California); Ph.D. (University of Tennessee), Assistant Professor of Radiobiology (*Physiology*).

Robert Hasling Rice, S.B. (Massachusetts Institute of Technology), Ph.D. (University of California), Assistant Professor of Toxicology (*Physiology*).

U. Ingrid Richardson, S.B. (Cornell University); Ph.D. (Stanford University), Assistant Professor of Toxicology (*Physiology*); *Assistant Professor of Pharmacology, Harvard Medical School.*

Marc Jeffrey Roberts, A.B., Ph.D. (Harvard University), Professor of Political Economy (*Health Policy and Management*).

Barbara Gutmann Rosenkrantz, A.B. (Radcliffe College); Ph.D. (Clark University), Professor of the History of Science in the Faculty of Arts and Sciences and the Faculty of Public Health.

Kenneth Jay Rothman, A.B. (Colgate University); D.M.D., M.P.H., Dr.P.H. (Harvard University), Associate Professor of Epidemiology.

A. Yvonne Russell, Ph.D. (State University of Iowa); M.D. (University of Chicago), Lecturer on Maternal and Child Health; *Director, U.S. Public Health Service Hospital.*

Hilton Aaron Salhanick, A.B., A.M., Ph.D. (Harvard University); M.D. (University of Utah), Frederick Lee Hisaw Professor of Reproductive Physiology (*Population Sciences*); *Professor of Obstetrics and Gynecology, Harvard Medical School.*

David Alan Schoenfeld, A.B. (Reed College); A.M., Ph.D. (University of Oregon), Assistant Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute.*

Agnes Schonbrunn, S.B. (McGill University); Ph.D. (Brandeis University), Assistant Professor of Toxicology (*Physiology*).

Ascher Jasha Segall, M.D. (University of Lausanne, Switzerland); M.P.H., Dr.P.H. (Harvard University), Lecturer on Health Services (*Health Policy and Management*); *Professor of Epidemiology, School of Medicine, Boston University; Professor of Education, School of Education, Boston University.*

Jacob Shapiro, S.B. (College of the City of New York); S.M. (Brown University); Ph.D. (University of Rochester), Lecturer on Biophysics in Environmental Health (*Environmental Health Sciences*).

Robert Walter Shapiro, A.B. (Princeton); M.D. (Yale University), Lecturer on Epidemiology; *Associate Professor of Psychiatry, Harvard Medical School.*

Stanley Harvey Shapiro, S.B. (Bucknell University); S.M., Ph.D. (Stanford University), Visiting Associate Professor of Biostatistics; *Associate Professor of Epidemiology and Health, McGill University.*

Alan Sheldon, B.A., M.B., B. Chir., M.A. (Cambridge University), D.P.M. (Royal College of Physicians and Surgeons), S.M. in Hyg. (Harvard University), Associate Professor of Behavioral Sciences (*Health Policy and Management*); Director of the Office of Executive Programs in Health Policy and Management.

Herbert Sherman, B.E.E. (College of the City of New York); M.E.E., D.E.E. (Polytechnic Institute of Brooklyn), Lecturer on Health Services Administration (*Health Policy and Management*); Associate Director for Technology in the Center for the Analysis of Health Practices.

Thomas Jay Smith, A.B., M.P.H., S.M., Ph.D. (University of Minnesota), Associate Professor of Industrial Hygiene (*Environmental Health Sciences* and *Physiology*).

Stover Hoffman Snook, A.B. (Hartwick College); A.M. (Fordham University); Ph.D. (Tufts University), Lecturer on Ergonomics (*Physiology*); *Project Director, Liberty Mutual Insurance Company.*

Sergei Pitirimovitch Sorokin, A.B., M.D. (Harvard University), Associate Professor of Cell Biology (*Physiology*).

Roger Benham Spaulding, A.B. (Colgate University), Member of the Faculty of Public Health; Special Assistant to the Dean.

Frank Irwin Speizer, A.B., M.D. (Stanford University), Associate Professor of Epidemiology (*Physiology*); *Associate Professor of Medicine, Harvard Medical School.*

John Daniel Spengler, S.B. (University of Notre Dame); Ph.D. (State University of New York at Albany); S.M. in Env. H. (Harvard University), Assistant Professor of Environmental Health.

Andrew Spielman, S.B. (Colorado College); S.D. (The Johns Hopkins University), Associate Professor of Tropical Public Health.

Kenneth Earl Stanley, A.B. (Alfred University); A.M. (Bucknell University); Ph.D. (University of Florida), Assistant Professor of Biostatistics; *Statistician, Sidney Farber Cancer Institute.*

William Boaz Stason, S.B. (University of Michigan); M.D., M.P.H. (Harvard University), Associate Professor of Health Services Administration (*Health Policy and Management*).

Armen Haig Tashjian, Jr., S.B. (Yale University); M.D. (Harvard University), Professor of Toxicology (*Physiology*); *Professor of Pharmacology, Harvard Medical School.*

Amy Kriger Taylor, A.B. (Radcliffe College); A.M., Ph.D. (Harvard University), Assistant Professor of Economics (*Health Policy and Management*).

Shirley Warnock Thenen, A.B., Ph.D. (University of California, Berkeley), Associate Professor of Nutrition.

Lawrence Alcidos Thibodeau, S.B. (University of Tampa, Florida); Ph.D. (University of Minnesota), Assistant Professor of Biostatistics.

Harold Allen Thomas, Jr., S.B. (Carnegie Institute of Technology); S.M., S.D. (Harvard University), Gordon McKay Professor of Civil and Sanitary Engineering.

Mark Smith Thompson, A.B., M.P.P., Ph.D. (Harvard University), Assistant Professor of Health Services Administration (*Health Policy and Management*); Associate in the Center for the Analysis of Health Practices.

William Augustine Toscano, S.B., S.M. (Indiana University); Ph.D. (University of Illinois), Assistant Professor of Toxicology (*Physiology*).

Eoin William Trevelyan, F.C.A. Institute of Chartered Accountants, England); M.B.A., D.B.A. (Harvard University), Lecturer on Management (*Health Policy and Management*).

Isabelle Valadian, M.D. (Faculte Française de Medicine, Beirut, Lebanon); M.P.H. (Harvard University), Professor of Maternal and Child Health (*Maternal and Child Health and Aging*).

Peter Alexander Valberg, A.B. (Taylor University); A.M., Ph.D. (Harvard University), Assistant Professor of Physiology.

Richard Leonard Verrier, A.B. (University of New Hampshire); Ph.D. (University of Virginia), Assistant Professor of Physiology (*Nutrition*); *Assistant Professor of Medicine, Harvard Medical School.*

Warren Ernest Clyde Wacker, M.D. (George Washington University); A.M. (hon.) (Harvard University), Henry K. Oliver Professor of Hygiene; *Director of University Health Services.*

Alexander Muir Walker, A.B., M.P.H., M.D., Dr. P.H. (Harvard University), Assistant Professor of Epidemiology.

Deborah Klein Walker, A.B. (Mt. Holyoke College); Ed.M., Ed.D. (Harvard University), Assistant Professor of Human Development in the Faculty of Arts and Sciences and the Faculty of Public Health (*Behavioral Sciences* and *Maternal and Child Health and Aging*).

James Hutchinson Ware, A.B. (Yale University), Ph.D. (Stanford University), Associate Professor of Biostatistics (*Biostatistics*).

Christine Waternaux, M.A. (Faculte de Sciences Economiques de l'Universite de Paris); Ph.D. (Yale University), Assistant Professor of Biostatistics.

Edward William Webster, B.Sc., Ph.D. (University of London), Lecturer on Medical Radiation Physics (*Environmental Health Sciences*); *Professor of Radiology (Physics), Harvard Medical School.*

Henry Wechsler, A.B. (Washington and Jefferson College); A.M., Ph.D. (Harvard University), Lecturer on Social Psychology (*Behavioral Sciences*); *Research Director, The Medical Foundation, Inc.*

David Howe Wegman, A.B. (Swarthmore College); M.D., S.M. in Phys. (Harvard University), Associate Professor of Occupational Health (*Physiology*).

Milton Charles Weinstein, A.B., A.M., M.P.P., Ph.D. (Harvard University), Professor of Policy and Decision Sciences (*Biostatistics*).

Thomas Huckle Weller, A.B., S.M. (University of Michigan); M.D. (Harvard University); LL.D. (University of Michigan), Richard Pearson Strong Professor of Tropical Public Health; Director of the Center for Prevention of Infectious Diseases.

James Laverre Whittenberger, S.B., M.D. (University of Chicago); A.M. (hon.) (Harvard University), James Stevens Simmons Professor of Public Health; Professor of Physiology; Director of the Kresge Center for Environmental Health.

Walter Churchill Willett, M.D. (University of Michigan), M.P.H., Dr.P.H. (Harvard University), Assistant Professor of Epidemiology.

Jelia Cox Witschi, S.B. (West Virginia University); S.M. (Case Western University), Assistant Professor of Nutrition.

Joe David Wray, A.B., M.D. (Stanford University); M.P.H. (University of North Carolina), Senior Lecturer on International Health and Maternal and Child Health (*Maternal and Child Health and Aging* and *Population Sciences*); Director of the Office of International Health.

John Benjamin Wyon, B.A., M.B.,B.Ch. (Cambridge University); M.P.H. (Harvard University), Senior Lecturer on Population Studies.

Joseph Anthony Yacovone, A.B. (Brown University); D.M.D. (Tufts University); M.P.H. (Harvard University), Lecturer on Dental Public Health (*Health Policy and Management*); *Assistant Clinical Professor of Dental Ecology, Harvard School of Dental Medicine; Chief, Office of Comprehensive Planning, Rhode Island Department of Health.*

Alonzo Smythe Yerby, S.B. (University of Chicago); M.D. (Meharry Medical College); M.P.H. (Harvard University), Professor of Health Services Administration (*Health Policy and Management* and *Maternal and Child Health and Aging*).

David William Young, A.B. (Occidental College); A.M. (University of California); D.B.A. (Harvard University), Associate Professor of Management (*Health Policy and Management*).

Marvin Zelen, S.B. (The City College of New York); A.M. (University of North Carolina); Ph.D. (American University), Professor of Statistical Science (*Biostatistics*); *Member of the Faculty of Arts and Sciences; Director of Statistics Unit, Sidney Farber Cancer Institute.*

The Teaching Staff

Walter Pierce Allen, M.B.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

David Martin Anderson, Ph.D., Visiting Lecturer on Industrial Hygiene Engineering (*Environmental Health Sciences*).

Kay Walker Bander, S.M. in H.S.Ad., Visiting Lecturer on Health Services Administration (*Health Policy and Management*).

Mary Jane Ferraro Benfari, Ph.D., M.P.H., Instructor in Microbiology.

Arthur Angelo Berarducci, M.P.H., Lecturer on Health Services Administration (*Health Policy and Management*).

Donald Mark Berwick, M.D., M.P.P., Instructor in Health Services (*Health Policy and Management*).

Charles Edgar Billings, Ph.D., Visiting Lecturer on Environmental Health Engineering (*Environmental Health Sciences*).

Laurence Herbert Bishoff, S.B., Visiting Lecturer on Health Services (*Health Policy and Management*).

Kenneth Dale Bloem, S.M. in H.P.M., Visiting Lecturer on Health Services (*Health Policy and Management*).

David Blumenthal, M.D., M.P.P., Visiting Lecturer on Health Services (*Health Policy and Management*).

John Dunning Boice, Jr., S.D. in Epid., Visiting Lecturer on Epidemiology.

Thomas Ball Bracken, LL.B., Visiting Lecturer on Community Air Pollution (*Environmental Health Sciences*).

Stanley Gene Burchfield, M.B.A., M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

Sheldon Daniel Bycoff, M.B.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

Charles Edward Cloherty, A.B., Visiting Lecturer on Health Services (*Health Policy and Management*).

Shepard Nathan Cohen, M.P.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

Philip Timothy Cole, M.D., Dr.P.H., Visiting Lecturer on Epidemiology.

Susan Mary Cotter, D.V.M., Visiting Lecturer on Cancer Biology (*Microbiology*).

Raymond Douglas Cotton, J.D., S.M. in Hyg., Visiting Lecturer on Health Law (*Health Policy and Management*).

Kathleen Ridder Crampton, M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

John Eustace Cupples, M.Th., Visiting Lecturer on Health Services (*Health Policy and Management*).

Gustave John Dammin, M.D., Lecturer on Tropical Public Health.

Rita Dickinson De Lollis, M.D., M.P.H., Lecturer on Maternal and Child Health (*Maternal and Child Health and Aging*).

Paul Maximillian Densen, D.Sc., M.A. (hon.), Lecturer on Preventive and Social Medicine (*Health Policy and Management*).

Chester William Douglass, D.D.S., M.P.H., Ph.D., Lecturer on Public Health Dentistry (*Health Policy and Management*).

Janet Berube Douglass, S.M., Lecturer on Occupational Health Nursing (*Physiology*).

Harold Bruce Dull, M.D., S.M. in H.S.Ad., Visiting Lecturer on Health Law (*Health Policy and Management*).

Karin Arntz Dumbaugh, A.M., S.M. in H.S.-Ad., S.D., Instructor in Health Services (*Health Policy and Management*).

Bruce Anthony Egan, S.M. in M.E., S.D. in Env.H., Visiting Lecturer on Air Pollution Meteorology (*Environmental Health Sciences*).

Manning Feinleib, M.D., Dr.P.H., Visiting Lecturer on Epidemiology.

Robert George Feldman, M.D., Lecturer on Neurology (*Physiology*).

Neville Rex Edwards Fendall, M.D., D.P.H., Visiting Lecturer on Tropical Public Health.

Mark George Field, Ph.D., Visiting Lecturer on Health Services Administration (*Health Policy and Management*).

Nicholas John Fiumara, M.D., M.P.H., Visiting Lecturer on Infectious Diseases (*Microbiology*).

William Herbert Foege, M.D., M.P.H., Visiting Lecturer on Tropical Public Health.

Stanley Norton Gershoff, Ph.D., Visiting Lecturer on Nutrition.

Robert Frederick Gilfillan, Ph.D., Visiting Lecturer on Applied Microbiology.

Edwin Martin Gold, M.D., Visiting Lecturer on Maternal and Child Health (*Maternal and Child Health and Aging*).

George Francis Grady, M.D., Visiting Lecturer on Applied Microbiology.

Rodrigo Guerrero, M.D., S.M. in Hyg., Dr.P.H., Visiting Lecturer on Population Sciences.

John Anthony Hargreaves, L.D.S., M.Ch.D., Lecturer on Public Health Dentistry (*Maternal and Child Health and Aging*).

John Edwin Herrmann, S.M., Ph.D., Visiting Lecturer on Microbiology.

Frank Macmillan Holden, M.D., Visiting Lecturer on Health Services (*Health Policy and Management*).

Donald Roswell Hopkins, M.D., M.P.H., Visiting Lecturer on Tropical Public Health.

Anthony Paul Hourihan, M.B.A., Instructor in Finance (*Health Policy and Management*).

Eleanor May Irish, M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

Rudolph John Jaeger, Ph.D., Visiting Lecturer on Occupational and Environmental Toxicology (*Environmental Health Sciences*).

Hershel Jick, M.D., Lecturer on Epidemiology.

G. Timothy Johnson, M.D., M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

Robert Lincoln Kaiser, M.D., D.T.M.&H., Visiting Lecturer on Tropical Public Health.

Anne Brown Keith, S.M. in H.S.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

Gerald Lawrence Klerman, M.D., Lecturer on Behavioral Sciences.

David Kent Kline, Ph.D., Lecturer on Education (*Population Sciences*).

Anthony Leader Komaroff, M.D., Visiting Lecturer on Health Services (*Health Policy and Management*).

Jeffrey Powell Koplan, M.D., M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

David Craig Korten, M.B.A., Ph.D., Visiting Lecturer on Population Studies.

Frances Fisher Korten, Ph.D., Visiting Lecturer on Population Studies.

Marc Karnis Landy, Ph.D., Visiting Lecturer on Political Science (*Health Policy and Management*).

Barry Steven Levy, M.D., M.P.H., Lecturer on Occupational Health (*Physiology*).

Frederick Pei Li, M.D., Lecturer on Epidemiology.

Matthew Heng Liang, M.D., M.P.H., Lecturer on Health Services (*Health Policy and Management*).

Franz Cornelius von Lichtenberg, M.D., Lecturer on Tropical Public Health.

Stephen Lorch, S.B., Lecturer on Health Services Administration (*Health Policy and Management*).

Alex Bruce MacDonald, Ph.D., Visiting Lecturer on Immunology (*Microbiology*).

James Richard Mahoney, Ph.D., Visiting Lecturer on Applied Meteorology (*Environmental Health Sciences*).

Robert John Marra, M.B.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

Leonardo Jimenez Mata, S.D. in Hyg., Visiting Lecturer on Tropical Public Health.

Edward Noel McIntosh, M.D., S.D. in Popl., Visiting Lecturer on Population Sciences.

Timothy Francis Meehan, A.B., Visiting Lecturer on Health Services (*Health Policy and Management*).

Robert Warwick Miller, M.D., Dr.P.H., Visiting Lecturer on Epidemiology.

Jean Eileen Morehead, M.P.H., S.D. in H.S.-Ad., Visiting Lecturer on Population Studies.

Robert Morris, D.S.W., Visiting Lecturer on Health Services (*Health Policy and Management*).

Samuel Leonard Moschella, M.D., Visiting Lecturer on Tropical Public Health.

Harry Most, M.D., D.T.M.&H., D.M.S., Visiting Lecturer on Tropical Public Health.

Kenneth Eugene Mott, M.D., M.P.H., Visiting Lecturer on Tropical Public Health.

William Boss Munier, M.D., M.B.A., Visiting Lecturer on Health Services Administration (*Health Policy and Management*).

Kenneth William Nelson, S.M., Visiting Lecturer on Environmental Health.

Franklin Allen Neva, M.D., Visiting Lecturer on Tropical Public Health.

Eli Herbert Newberger, M.D., S.M. in Epid., Lecturer on Child Health (*Maternal and Child Health and Aging*).

Robert James Nicolosi, Ph.D., Lecturer on Nutrition.

Andrew Horton Nighswander, J.D., Visiting Lecturer on Health Services (*Health Policy and Management*).

Patricia Anne O'Brien, M.B.A., Lecturer in Health Policy and Management.

Judith Keller Ockene, Ph.D., Lecturer on Behavioral Sciences.

L. Christine Oliver, M.D., M.P.H., S.M. in Phys., Visiting Lecturer on Occupational Medicine (*Physiology*).

Ralph Seal Paffenbarger, Jr., M.D., Dr.P.H., Visiting Lecturer on Epidemiology.

Stephen J Plank, M.D., Dr.P.H., Visiting Lecturer on Population Studies.

Hugh Llewellyn Popenoe, Ph.D., Visiting Lecturer on Tropical Public Health.

Thomas Oakley Pyle, M.B.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

Mitchell Thornton Rabkin, M.D., Visiting Lecturer on Health Services (*Health Policy and Management*).

Jacqueline Miller Rosenthal, M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

Richard Martin Ryan, S.D. in Hyg., Lecturer on Health Services (*Maternal and Child Health and Aging*).

Kenneth Wayne Samonds, Ph.D., Visiting Lecturer on Nutrition.

Elizabeth Woodland Sands, J.D., Visiting Lecturer on Health Services (*Health Policy and Management*).

Philip Earl Sartwell, M.D., M.P.H., Visiting Lecturer on Epidemiology.

Helen Halpin Schauffler, S.M. in H.P. & M., Visiting Lecturer on Health Services (*Health Policy and Management*).

Nevin Stewart Scrimshaw, Ph.D., M.D., M.P.H., Visiting Lecturer on Tropical Public Health.

Jack M. Selby, S.B., Visiting Lecturer on Radiation Protection (*Environmental Health Sciences*).

David Judson Sencer, M.D., M.P.H., Visiting Lecturer on Tropical Public Health.

Stuart Howard Shapiro, M.D., M.P.H., Visiting Lecturer on Health Services (*Health Policy and Management*).

Donald Sloane Shepard, M.P.P., Ph.D., Lecturer on Health Services (*Health Policy and Management*).

Judith Pelhaman Smith, M.P.A., Visiting Lecturer on Health Services (*Health Policy and Management*).

Allen Howard Storm, M.D., M.P.H., Lecturer on Occupational Health (*Physiology*).

Julian Max Strauss, D.V.M., Visiting Lecturer on Population Sciences.

Phillip George Stubblefield, M.D., Visiting Lecturer on Maternal Health (*Maternal and Child Health and Aging*).

Goran K. Svensson, D.Sc., Lecturer on Medical Radiation Physics (*Environmental Health Sciences*).

James Oliver Taylor, M.D., Visiting Lecturer on Health Services (*Health Policy and Management*).

Frederick James Viles, Jr., S.M., Visiting Lecturer on Industrial Hygiene (*Environmental Health Sciences*).

Julia Ann Walsh, M.D., Visiting Lecturer on Infectious Disease Epidemiology (*Microbiology*).

James Heber Warram, Jr., M.D., S.M. in Hyg., Visiting Lecturer on Epidemiology.

Carl Norman Wathne, S.M., Visiting Lecturer on Health Services (*Health Policy and Management*).

Jay Andrew Winsten, Ph.D., Lecturer on Health Services (*Health Policy and Management*); Director of the Office of Health Policy Information and Director of Foundations and Government Relations.

George Green Wright, Ph.D., Visiting Lecturer on Applied Microbiology.

Robert Edward Zimmerman, S.M., Visiting Lecturer on Medical Radiological Physics (*Environmental Health Sciences*).

The Research Staff

Paul Martin Aebersold, Ph.D., Research Associate in Radiobiology (*Physiology*).

Lynne Margaret Ausman, S.D. in Nutr., Research Associate in Nutrition.

Robert Bruce Banzett, Ph.D., Research Associate in Physiology.

Catherine Susan Berkey, S.D. in Bio., Research Associate and Lecturer on Maternal and Child Health.

Dorothy Bruno, S.B., Assistant in Nutrition.

Julie Elizabeth Buring, S.D., Research Associate in Epidemiology.

Ruth Margaret Butler, S.M., Research Associate in Social Work (*Maternal and Child Health and Aging*).

Robert Lee Cannon, III, Consultant on Bioengineering (*Nutrition*).

Robert Glenn Castile, M.D., Research Associate in Physiology.

Shu-heh Wang Chu, Ph.D., Research Associate in Nutrition.

Mary Antoinette Walz Ciconni, Ph.D., Research Associate in Tropical Public Health.

Regis Anthony DeSilva, M.B., S.B., Research Associate in Cardiology (*Nutrition*).

Douglas William Dockery, S.D. in Env. H., Research Associate in Environmental Health.

Elaine Donna Eaker, S.D. in Beh. S., Research Associate in Behavioral Sciences.

John Joseph Eckenrode, Ph.D., Research Associate and Lecturer on Psychology (*Behavioral Sciences*).

William David Finkle, Ph.D., Research Associate in Epidemiology.

Anna Gotsis Gallagher, Assistant in Nutrition.

Daniel Lino Gallina, M.D., Research Associate in Nutrition.

Richard Bradley Gamble, A.M., Consultant on Population Problems (*Population Sciences*).

Kenneth Francis Girard, Ph.D., Research Associate in Microbiology.

Lawrence Irving Goldberger, Ph.D., Research Associate in Psychology (*Nutrition*).

Jack Mark Goldstein, Ph.D., Consultant on Instrumentation (*Population Sciences*).

Thomas Barr Graboys, M.D., Research Associate in Cardiology (*Nutrition*).

Joel Steven Greenberger, M.D., Research Associate in Microbiology.

Tamara K. Hareven, Ph.D., Research Associate in Population Studies.

Patricia Henson, Ph.D., Research Associate in Radiobiology (*Physiology*).

Hugh Robert Holtrop, M.D., Research Associate and Lecturer on Population Studies.

Frederic Gallatin Hoppin, Jr., M.D., Research Associate in Physiology.

Chang-I Hua, Ph.D., Research Associate in Population Studies.

Francine Helene Jacobs, Ed.D., Research Associate in Human Development (*Maternal and Child Health and Aging*).

Charles Alderson Janeway, M.D., Consultant on Child Health (*Maternal and Child Health and Aging*).

Shozaburo Jimi, M.D., Dr.Med.Sci., Research Associate in Epidemiology.

Robert Alan Lew, Ph.D., Research Associate in Nutrition and Biostatistics (*Nutrition*).

Stephen Hathaway Loring, M.D., Research Associate in Physiology.

Robert Denis Lynch, S.D. in Nutr., Research Associate in Nutrition.

James Harvey Maguire, M.D., M.P.H., Research Associate in Tropical Public Health.

Robert Burnett McGandy, M.D., M.P.H., Consultant on Pathology (*Nutrition* and *Physiology*).

Gerald Murray, Ph.D., Research Associate in Population Studies.

Hatsumi Nagasawa, Ph.D., Research Associate in Radiobiology (*Physiology*).

Joseph Shalom Pliskin, Ph.D., Research Associate in the Center for the Analysis of Health Practice.

Philip Jack Podrid, M.D., Research Associate in Cardiology (*Nutrition*).

James Bragg Robertson, S.D. in Phys., Research Associate in Radiobiology (*Physiology*).

Daniel Henry Seeley, Ph.D., Research Associate and Lecturer on Biochemistry (*Population Sciences*).

Clayton Lay Thomas, M.D., M.P.H., Consultant on Human Reproduction (*Population Sciences*).

Helene Vetrovs, Assistant in Radiobiology (*Physiology*).

Edward Francis Voelkel, Research Associate in Toxicology (*Physiology*).

Susan Kemp Wheeldon, A.M., Assistant in Tropical Health.

Carmen Alonso Whipple, Ph.D., Research Associate and Lecturer on Population Studies (*Population Sciences*).

Jack Mikhail Wolfson, Ph.D., Research Associate in Environmental Health Sciences.

Stella Bernadette Yen, M.D., M.P.H., Research Associate in Epidemiology.

Glen Bart Zamansky, Ph.D., Research Associate in Radiobiology (*Physiology*).

Professors Emeriti

Donald Leslie Augustine, S.B., S.D. (hon.), A.M. (hon.), Professor of Tropical Public Health, Emeritus (1961).

Geoffrey Edsall, M.D., Professor of Applied Microbiology, Emeritus (1972).

Dana Lyda Farnsworth, A.B., S.B., M.D., S.D. (hon.), Henry K. Oliver Professor of Hygiene, Emeritus (1971).

Paul Maximillian Densen, A.B., S.D., A.M. (hon.), Professor of Community Health, Emeritus (1980).

John Everett Gordon, S.B., Ph.D., M.D., A.M. (hon.), F.R.C.P. (Lond.), Professor of Preventive Medicine and Epidemiology, Emeritus (1958).

Roy Orval Greep, S.B., S.M., Ph.D., A.M. (hon.), S.D. (hon.), John Rock Professor of Population Studies, Emeritus (1974).

David Mark Hegsted, S.B., S.M., Ph.D., A.M. (hon.), Professor of Nutrition, Emeritus (1980).

Alexander Hamilton Leighton, A.B., A.M., M.D., A.M. (hon.), Professor of Social Psychiatry, Emeritus (1975).

Roger Randall Dougan Revelle, A.B., Ph.D., S.D. (hon.), L.H.D., Richard Saltonstall Professor of Population Policy, Emeritus (1978).

Elizabeth Prince Rice, A.B., S.M., Associate Professor of Public Health Social Work, Emerita (1967).

William Morris Schmidt, S.B., M.D., A.M. (hon.), Professor of Maternal and Child Health, Emeritus (1973).

Richard Mason Smith, A.B., M.D., S.D. (hon.), Thomas Morgan Rotch Professor of Pediatrics, Emeritus (1946).

John Crayton Snyder, A.B., M.D., LL.D., Professor of Population and Public Health, Emeritus (1976).

Fredrick John Stare, S.B., S.M., Ph.D., M.D., A.M. (hon.), S.D. (hon.), D.Sc. (hon.), Professor of Nutrition, Emeritus (1980).

Jane Worcester, A.B., Dr.P.H., S.D. (hon.), Professor of Biostatistics and Epidemiology, Emerita (1977).

Marjorie Anne Christian Young, S.B., Ed.M., M.P.H., Dr.P.H., Professor of Health Education, Emerita (1978).

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Admissions Office
Harvard School of Public Health
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Boston, MA 02115

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